

**DIRECT TESTIMONY**  
**OF**  
**MICHAEL J. HAGER**

1 **I. Introduction**

2 Q. Please state your name and business address.

3 A. Michael J. Hager, 55 Bearfoot Road, Northboro, Massachusetts 01532.

4  
5 Q. Please state your position.

6 A. I am the Manager, Distribution Energy Services for National Grid USA Service  
7 Company, Inc. I am responsible for all power procurement and energy supply related  
8 activities for the retail companies of National Grid USA (formerly the New England  
9 Electric System) including Massachusetts Electric Company and Nantucket Electric  
10 Company ("Mass. Electric" or "Company"). These activities include the purchase of  
11 power from Qualify Facilities.

12  
13 Q. Will you describe your educational background and training?

14 A. In 1982, I graduated from the University of Hartford with a Bachelor of Science degree in  
15 Mechanical Engineering. In 1986, I received a Master of Science degree in Mechanical  
16 Engineering from Northeastern University. I am a Licensed Professional Engineer in the  
17 Commonwealth of Massachusetts.

18  
19 Q. What is your professional background?

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1     A.     From 1982 to 1992, I worked for New England Power Service Company in various  
2           engineering positions. In these positions, I provided support to New England Power  
3           Company's ("NEP") thermal and hydroelectric generating plants with overall  
4           responsibility for the management and control of studies and projects from initiation to  
5           completion.

6  
7           From 1992 to 1997, I was employed by NEP where I conducted wholesale and retail  
8           power marketing activities involving the sale and purchase of generation resources to and  
9           from investor-owned utilities, municipalities, independent power producers, government  
10          agencies, brokers, marketers, and end-use retail customers.

11  
12          In June 1997, I was promoted to the position of Standard Offer Portfolio Manager for  
13          New England Power Service Company (now National Grid USA Service Company, Inc.).

14          In November 2000, my title was changed to Manager, Distribution Energy Services, to  
15          more fully reflect the scope of work performed by my department.

16  
17     Q.     Have you testified before regulatory commissions before?

18     A.     Yes. I have testified before the Massachusetts Department of Telecommunications and  
19           Energy, the Rhode Island Public Utilities Commission, the New Hampshire Public

1 Utilities Commission, and the Federal Energy Regulatory Commission in various power  
2 procurement and associated rate proceedings.  
3

4 **II. Purpose of Testimony**

5 Q. What is the purpose of your testimony?

6 A. The purpose of my testimony is to describe the Company's Interconnection Requirements  
7 Document. I am attaching as Exhibit A an Interconnection Requirements Document that  
8 has been marked to show the changes that the Company proposes to make to this  
9 document based on our responses to the Department's information requests. Exhibit B is  
10 a clean version of this document. When I refer to the Interconnection Requirements  
11 Document in this testimony, I am referring to the document as revised, as set forth in  
12 Exhibits A and B.  
13

14 **III. Interconnection Requirements Document**

15 Q. Please explain the purpose of the company's Interconnection Requirements Document.

16 A. The Company's Interconnection Requirements Document provides the process, technical  
17 requirements, and form of agreements needed for a customer wishing to interconnect with  
18 the Company's distribution system. The document covers all generation interconnections  
19 with the Company's system, including those classified as qualifying facilities and on-site

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1 generating facilities as defined in the Department's interconnection regulations at 220

2 C.M.R. 8.00 et seq.

3 Q. Please explain the contents of the document.

4 A. The document is organized into ten sections and contains six exhibits.

5  
6 Section 1 contains the applicability provisions for the document.

7  
8 Section 2 provides a list of definitions of common terms used throughout the document.

9  
10 Section 3 provides a summary of the process that the Company and customer will follow  
11 to accommodate requested interconnections.

12  
13 Section 4 provides for a classification of various facilities that would interconnect to the  
14 Company's system by size and technology. This classification is used to specify the  
15 applicable technical requirements for the interconnection. In addition, the section  
16 provides summary tables of requirements for most facilities.

17  
18 Section 5 describes the party's obligations to construct and pay for any needed facilities,  
19 requires an engineers report for certain facilities to determine the taxable status of the  
20 interconnections and specifies requirements for any land, permits, licenses, franchises or

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1 regulatory or other approvals needed for the construction, operation or maintenance of  
2 any system upgrades.

3  
4 Section 6 establishes the customer obligation to pay for any system upgrades required to  
5 accommodate the interconnection.

6  
7 Section 7 specifies the voltage level for the interconnection, reactive capability  
8 requirements and metering and billing options available to the customer.

9  
10 Section 8 specifies the Company's right to disconnect a facility, upon provision of notice,  
11 if it adversely affects the Company's system or quality of service to the Company's  
12 customers.

13  
14 Section 9 provides for the Company's right to access to the facility to make reasonable  
15 inspections and obtain required information.

16  
17 Section 10 contains commercial terms and requirements relating to force majeure,  
18 indemnification and insurance requirements.

19  
20 Exhibit 1 provides a list of information that the customer must give to the Company to

1 initiate the interconnection process.

2  
3 Exhibit 2 is the form of agreement between the Company and customer that allows for the  
4 interconnection and operation of the facility.

5  
6 Exhibit 3 provides the technical requirements relating to protection requirements. The  
7 requirements are organized by size of the facility and technology utilized for ease of use  
8 by the customer.

9  
10 Exhibit 4 is the form of agreement between the customer and Company that would be  
11 used when a Distribution Facilities Impact Study is to be performed. The document  
12 specifies, in Section 3 and Section 4, when such a study would be needed.

13  
14 Exhibit 5 is the form of agreement between the customer and Company that would be  
15 used when a Distribution Facilities Detailed Study is to be performed. The document  
16 specifies, in Section 3 and Section 4, when such a study would be needed.

17  
18 Exhibit 6 provides specific insurance coverage requirements.

19  
20 Q. Is this document consistent with the Department's regulations regarding interconnections,

1       220 CMR 8.00 et seq.?

2       A.     Yes. The Interconnection Requirements Document, inclusive of the changes that the  
3       Company has proposed to make in response to these Information Requests, is consistent  
4       with 220 CMR 8.00 et seq. At all times, the Company intends to interpret and implement  
5       it consistent with 220 CMR 8.00 et seq., where applicable. More specifically:

6  
7       Section 1: The Interconnection Requirements Document includes, but is not limited to,  
8       the types of facilities specified in 220 CMR 8.01(2), qualifying facilities and on-site  
9       generating facilities.

10  
11       Section 2: The definitions are consistent with the definitions in 220 CMR 8.02.

12  
13       Section 3: The process overview is consistent with the process set forth in 220 CMR 8.04  
14       through 8.06.

15  
16       Section 4: The basic understandings are consistent with 220 CMR 8.03 through 8.06.

17  
18       Section 5: The construction of the Distribution Facilities Upgrades is consistent with 220  
19       CMR 8.04.



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1 Section 6: The Distribution Facilities Upgrades charge is consistent with 220 CMR  
2 8.04(7).  
3

4 Section 7: The delivery and measurement of electricity section is consistent with 220  
5 CMR 8.03 and 8.04.  
6

7 Section 8: The notice provisions do not conflict with any part of 220 CMR 8.00 et seq.  
8

9 Section 9: The access and control provisions are consistent with 220 CMR 8.04(5).  
10

11 Section 10: This section does not conflict with any part of 220 CMR 8.00 et seq.  
12

13 Q. Does this conclude your testimony?

14 A. Yes. It does.

## **INTERCONNECTION REQUIREMENTS DOCUMENT CUSTOMER-OWNED GENERATING FACILITIES**

### **1.0 Preamble**

This document (“Interconnection Requirements Document”) describes the process and requirements for a customer to connect a Facility, as defined herein, to the Company’s Distribution System.

The process and requirements contained herein are applicable to all Facilities interconnecting with the Company’s Distribution System including Qualifying Facilities, as defined in 220 CMR 8.02, and On-Site Generating Facilities, as defined in 220 CMR 8.02.

The process and requirements contained herein are not applicable to portable emergency generators. Such generators must be installed in accordance with Article 700 of the National Electrical Code and Article 310 of the National Grid USA publication Information and Requirements for Electric Service Handbook in such a manner as to ensure that the generator cannot be operated in parallel with the Company’s Distribution System. Attempting to interconnect a generator of this type with the Company’s Distribution System, except as specified above, can cause significant damage to the Company’s Distribution System and catastrophic damage to the Interconnecting Customer’s generator and premises.

The Company will work closely and promptly with any customer who desires to install a Facility.

### **2.0 Definitions**

The following words and terms shall be understood to have the following meanings when used in this Interconnection Requirements Document:

**Affiliate:** Any company that is a subsidiary of National Grid USA.

**Company:** Massachusetts Electric Company or Nantucket Electric Company, as applicable.

**Designated Agent:** Any entity that performs actions or functions on behalf of the Company or the Interconnecting Customer required under this Interconnection Requirements Document and/or the Exhibits hereto.

**Distribution Facilities Upgrades:** Modifications or additions to distribution-related facilities that are integrated with and support the Company's Distribution System for the benefit of the Interconnecting Customer.

**Distribution Facilities Impact Study:** The first phase of engineering study conducted by the Company to determine the required modifications to its Distribution System, resulting in study grade cost estimates (+/- 25%) and an approximate estimate of the time required for such modifications that will be required to provide the requested interconnection service. The Distribution Facilities Impact Study is not suitable for finalizing agreements, contracts or commitments.

**Distribution Facilities Detailed Study:** The final phase of engineering study conducted by the Company to determine the required detailed modifications to its Distribution System, resulting in project grade cost estimates (+/- 10%) and an estimate of the time required for such modifications that will be required to provide the requested interconnection service.

**Distribution Facilities Upgrades Charge:** A charge to be paid by an Interconnecting Customer equal to all costs associated with the upgrade or modification of the Distribution System for safe interconnection of the Facility with the Company's Distribution System.

**Distribution System:** The facilities owned, controlled or operated by the Company that are used to provide distribution service to its customers.

**Facility:** A customer-owned source of electricity, which may be an Inverter or a rotating generator of the synchronous or induction type and all facilities ancillary and appurtenant thereto, which the Interconnecting Customer requests to interconnect to the Distribution System.

**Good Utility Practice:** Any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region.

**In-Service Date:** The date on which the Facility and Distribution Facilities Upgrades (if applicable) are complete and ready for service, even if the Facility is not placed in service on or by that date.

**Interconnecting Customer:** A customer desiring to install an independently-operated Generating Facility, which is interconnected with the Company's Distribution System.

**Interconnection Service Agreement:** An agreement for interconnection service, the form of which is provided in Exhibit 2, between the Interconnecting Customer and the Company. The agreement also includes any amendments or supplements thereto entered into by the Interconnecting Customer and the Company.

**Inverter:** An electrical device that accepts direct current as input, and produces alternating current as output.

**ISO-New England:** The Independent System Operator established in accordance with the New England Power Pool ("NEPOOL") Agreement, which is responsible for managing the bulk power generation and transmission systems in New England.

**Metering Point:** For meters that do not utilize instrumentation transformers, the point at which the billing meter is connected. For meters that utilize instrumentation transformers, the point at which the instrumentation transformers are connected.

**Network Distribution System:** Electrical service where two or more distribution transformers have their secondary windings connected in parallel to form a network of conductors supplying service voltage to customers. Primary voltage to the transformers

may come from a number of independent circuits, so that loss of one primary circuit will not generally cause a loss of service voltage to customers.

**Notice of Intent to Interconnect:** Notice provided by Interconnecting Customer to the Company, the form of which is shown in Exhibit 1, which initiates the interconnection process.

**On-Site Generating Facility:** A class of customer-owned generating facilities with peak capacity of 60 kW or less, as defined in 220 CMR 8.02.

**Parties:** The Company and the Interconnecting Customer.

**Policy and Practices for Protection Requirements for New or Modified**

**Interconnections:** The Company's policy concerning protection requirements for new or modified interconnections to power sources, which is included in Exhibit 3 to this Interconnection Requirements Document and attached and incorporated by reference.

**Point of Delivery:** A point on the Company's Distribution System where the Interconnecting Customer makes capacity and energy available to the Company. The point of Delivery shall be specified in the Interconnection Service Agreement.

**Point of Receipt:** A point on the Company's Distribution System where the Company delivers capacity and energy to the Interconnecting Customer. The Point of Receipt shall be specified in the Interconnection Service Agreement.

**Qualifying Facility:** A generation facility that has received certification as a Qualifying Facility from the Federal Energy Regulatory Commission in accordance with the Federal Power Act, as amended by the 1978 Public Utilities Regulatory Policies Act, as defined in 220 CMR 8.02.

**Radial Distribution System:** Electrical service from a system consisting of one or more primary circuits extending from a single substation or transmission supply point arranged such that each primary circuit serves customers in a particular local area.

### **3.0 Process Overview**

The process of interconnecting a Facility with the Company's system is as follows:

- a. The Interconnecting Customer submits a Notice of Intent to Interconnect (“Notice of Intent”) to the Company. The information that is required to be provided in the Notice of Intent is provided in Exhibit 1. Such notice shall be sent to:

Massachusetts Electric Company  
55 Bearfoot Road  
Northboro, MA 01532  
Attn: Senior Vice President – Business Services

- b. Upon receipt of the Notice of Intent, the Company will assign an Account Manager to work with the Interconnecting Customer and serve as the point of contact for all future activities. The Notice of Intent will be reviewed for completeness and to verify that the request is for an interconnection to the Company’s Distribution System. In addition, if the Notice of Intent is for an Inverter-based Facility, the Company will determine if the Facility complies with UL Standard 1741. If any of these requirements are not met, the Interconnecting Customer will be provided written notice and the application process will be suspended until the Interconnecting Customer has remedied any deficiencies.
- c. Upon verification and within 45 days of the Company’s receipt of the Notice of Intent, the Company will conduct an initial site inspection of the proposed Facility to determine if a Distribution Facilities Impact Study is required. If a Distribution Facilities Impact Study is not required and the Facility meets the requirements for immediate interconnection to the Company’s system, the Interconnecting Customer and the Company shall execute an Interconnection Service Agreement, the form of which is provided in Exhibit 2, and the Interconnecting Customer shall pay the Company the amount specified in such agreement. In some cases, the Company may

determine that a Distribution Facilities Impact Study is not required and may proceed directly with a Distribution Facilities Detailed Study.

- d. If a Distribution Facilities Impact Study is required, the Company will prepare a cost estimate to perform a Distribution Facilities Impact Study and will submit such estimate to the Interconnecting Customer.
- e. If the Interconnecting Customer elects to proceed with the Distribution Facilities Impact Study, the Interconnecting Customer and the Company shall execute a Distribution Facilities Impact Study Agreement, the form of which is provided in Exhibit 4, and the Interconnecting Customer shall pay the Company the amount specified in such agreement.
- f. Upon execution of the Distribution Facilities Impact Study Agreement and receipt of payment in full, the Company will conduct the Distribution Facilities Impact Study and upon completion of the work issue a Distribution Facilities Impact Study Report to the Interconnecting Customer.
- g. If a Distribution Facilities Detailed Study is required and the Interconnecting Customer elects to proceed with such study, the Company will prepare a cost estimate to perform a Distribution Facilities Detailed Study and will submit such estimate to the Interconnecting Customer.
- h. If the Interconnecting Customer elects to proceed with the Distribution Facilities Detailed Study, the Interconnecting Customer and the Company shall execute a Distribution Facilities Detailed Study Agreement, the form of which is provided in Exhibit 5, and the Interconnecting Customer shall pay the Company the amount specified in such agreement.

- i. Upon execution of the Distribution Facilities Detailed Study Agreement and receipt of payment in full, the Company will conduct the Distribution Facilities Detailed Study and upon completion of the work issue a Distribution Facilities Detailed Study Report to the Interconnecting Customer.
- j. If, upon receipt of the Distribution Facilities Detailed Study Report, the Interconnecting Customer elects to proceed with the construction of facilities to interconnect the Facility the Interconnecting Customer and the Company shall execute an Interconnection Service Agreement and the Interconnecting Customer shall pay the Company the amount specified in such Agreement. If the Interconnecting Customer does not agree with the Company's cost estimate, the Interconnecting Customer may petition the Massachusetts Department of Telecommunications and Energy to review the reasonableness of the Company's cost estimate.
- k. Upon execution of the Interconnection Service Agreement and receipt of payment in full, the Company will construct the required facilities.

#### **4.0 Basic Understandings**

The Interconnecting Customer intends to install a Facility on the Interconnecting Customer's premises. This power source will be connected electrically to the Company's Distribution System and operate in synchronism with the voltage and frequency maintained by the Company during normal operating conditions. The interconnection of the power source with the Company's Distribution System must meet the technical requirements of this Interconnection Requirements Document and may require an upgrade or other modifications to the Distribution System in order to meet such requirements. Subject to the requirements contained in this Interconnection Requirements Document, the Company or its Affiliate shall, at Interconnecting Customer's expense, modify the Distribution System accordingly.

#### **4.1 Facility Classification**



The interconnection requirements for a Facility or Inverter are dependent on its capacity and the type of power production technology utilized.

To determine the requirements for a given Facility, the following Categories and Types have been established:

Category	Maximum Output (kW)
1	$\leq 10$
2	$> 10$ and $\leq 60$
3	$> 60$ and $\leq 300$
4	$> 300$ and $\leq 1,000$
5	$> 1,000$

Type	Technology
A-1	Inverter-based, single phase
A-3	Inverter-based, three phase
B-1	Induction generator, single phase
B-3	Induction generator, three phase
C-1	Synchronous generator, single phase
C-3	Synchronous generator, three phase

Tables 1-A and 1-B provide an overview of the applicable interconnection requirements for Category 1, 2, 3 and 4 Facilities. Category 5 Facilities are subject to the full extent of requirements contained in this Interconnection Requirements Document

**TABLE 1A  
OVERVIEW OF INTERCONNECTION REQUIREMENTS**

Category 1 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-1	Requirement 1	Requirements 1 & 2	Allowed	Not Required
Type A-3	Requirement 1	Requirements 1 & 2	Allowed	Not Required
Type B-1	Requirement 3	Requirements 2 & 3	Allowed	Required **
Type B-3	Requirement 3	Requirements 2 & 3	Allowed	Required **
Type C-1	Requirement 4	Requirements 2 & 4	Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Allowed	Required

Category 2 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System	Net Metering	Distribution Facilities Impact Study
Type A-1	Requirement 1	Requirements 1 & 2	Allowed	Required (Note A)
Type A-3	Requirement 1	Requirements 1 & 2	Allowed	Required (Notes A & B)
Type B-1	Requirement 3	Requirements 2 & 3	Allowed	Required (Note A)
Type B-3	Requirement 3	Requirements 2 & 3	Allowed	Required (Notes A & B)
Type C-1	Requirement 4	Requirements 2 & 4	Allowed	Required (See Note A)
Type C-3	Requirement 4	Requirements 2 & 4	Allowed	Required (Notes A & B)

\* Most distribution systems are radial in nature; however, network systems are employed in some urban areas. Contact the Company to determine whether the proposed Facility site is served by a Radial Distribution System or Network Distribution System.

\*\* The scope of the study is expected to be minimal.

Requirement. 1: The Inverter must comply with UL Standard 1741.  
A photovoltaic system must also comply with IEEE Standard 929-2000.

Requirement. 2: ~~The Interconnecting Customer must demonstrate to the Company that the Facility minimum load is at least fifteen (15) times the peak output of the generating system. For installations in which the Facility minimum load is less than fifteen (15) times the peak output of the generating system, a reverse power flow relay will be required as part of the protection system. If the Facility minimum load is at least fifteen (15) times the peak output of the generating system, a reverse power flow relay will not be required.~~

Requirement. 3: The Facility must meet the protection requirements specified for induction generators as shown in Exhibit 3.

Requirement. 4: The Facility must meet the protection requirements specified for synchronous generators as shown in Exhibit 3.

Note A: If the Interconnecting Customer proposes to install a Facility with a capacity greater than 100% of the capacity of the distribution transformer providing site service, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

Note B: If the Interconnecting Customer receives single-phase electrical service from the Company but desires to install a three-phase power Facility, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

**TABLE 1B**  
**OVERVIEW OF INTERCONNECTION REQUIREMENTS**

Category 3 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-3	Requirement 1	Requirements 1 & 2	Not Allowed	Required (Note A)
Type B-3	Requirement 3	Requirements 2 & 3	Not Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Not Allowed	Required

Category 4 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-3	Requirement 1	Requirements 1 & 2	Not Allowed	Required
Type B-3	Requirement 3	Requirements 2 & 3	Not Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Not Allowed	Required

\* Most distribution systems are radial in nature; however, network systems are employed in some urban areas. Contact the Company to determine whether the proposed Facility site is served by a Radial Distribution System or Network Distribution System.

Requirement. 1: The Inverter must comply with UL Standard 1741.

Requirement. 2: ~~The Interconnecting Customer must demonstrate to the Company that the Facility minimum load is at least fifteen (15) times the peak output of the generating system. For installations in which the Facility minimum load is less than fifteen (15) times the peak output of the generating system, a reverse power flow relay will be required as part of the protection system. If the Facility minimum load is at least fifteen (15) times the peak output of the generating system, a reverse power flow relay will not be required.~~

Requirement 3: The Facility must meet the protection requirements specified for induction generators as shown in Exhibit 3.

Requirement 4: The Facility must meet the protection requirements specified for synchronous generators as shown in Exhibit 3.

Note A: If the Interconnecting Customer proposes to install a Facility with a capacity greater than 100% of the capacity of the distribution transformer providing service to the site, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

## 5.0 Construction of the Distribution Facilities Upgrades

**5.1 General Considerations:** The Company or its Affiliate or another party selected pursuant to this section shall construct the Distribution Facilities Upgrades at the Interconnecting Customer's expense. ~~The Company shall determine a schedule for construction and final interconnection. The Company shall use reasonable efforts to fulfill its obligations under this schedule in order to permit interconnection with the Facility in a timely manner. The Company shall determine a schedule for construction and final interconnection consistent with 220 CMR 8.04(6)(a). The Company shall fulfill its obligations under this schedule in order to permit interconnection with the Facility consistent with 220 CMR 8.04(6)(a).~~ The Company shall use, or specify that the selected contractor use, standard equipment customarily employed by the Company or its Affiliate for its own system in accordance with Good Utility Practice in making the final interconnection.

Pursuant to 220 CMR 8.04(3), the Interconnecting Customer also agrees to pay the Company for all reasonable costs and fees required to enable the Company to fulfill its obligations, including any tax liability, the costs and fees of all permits, licenses, franchises or regulatory or other approvals necessary for the construction and operation of the Distribution Facilities Upgrades and any facilities ancillary or appurtenant to them. The Company shall consult with the Interconnecting Customer on decisions involving substantial additional costs to be incurred by the Company in fulfillment of its obligations.

**5.2 QF Certification and Engineer's Report:** If the Interconnecting Customer is a Qualifying Facility, it shall provide the Company with proof that its facility has received certification as a Qualifying Facility from the Federal Energy Regulatory Commission in accordance with the Federal Power Act, as amended by the Public Utilities Regulatory Policies Act of 1978. Such proof shall be provided to the Company within the thirty (30) day period prior to the in-service date of the Facility. The Interconnecting Customer shall also provide the Company with notice of any change in its Qualifying Facility status within fifteen (15) days of any such change.

Further, within the thirty (30) day period prior to the In-Service Date, the Interconnecting Customer, at its expense, shall submit an independent engineer's report to the Company stating that it is reasonably projected that during the ten-year period, beginning with the year in which the Facility is placed in service, and, at the Interconnecting Customer's option, not including data from the first year of this ten-year period, no more than 5% of the total power flows (Athe 5% test@as defined by IRS Notice 88-129) over the interconnection to the Interconnecting Customer. Acceptance of this report shall be subject to the Company's review and concurrence. The Company may require that a second report be provided, at the Interconnecting Customer's expense, if the Company reasonably concludes that the first report is unreliable for purposes of anticipating the taxability of the services provided hereunder. In order to meet the requirements of IRS Notice 88-129 by March 1 of the year following the start of Interconnection Service, and annually thereafter, the Interconnecting Customer shall provide to the Company a report of the total bi-directional power flows over the interconnection during the previous calendar year.

The Interconnecting Customer agrees that payments to the Company hereunder will be deemed a contribution in aid of construction ("CIAC") and taxable to the Company if the Facility does not receive Qualifying Facility certification or the engineer's report concludes that the 5% test will not be met. In either event, the Interconnecting Customer agrees to pay the Company in advance for all taxes owed on the CIAC. Such payment shall be made within ten (10) days of notice from the Company of the estimated taxes owed, based on the Company's then effective gross-up factor times the amount of the CIAC. The Company may refuse final interconnection with the Facility until such payment is made.

**5.3 Land Interests:** The Interconnecting Customer recognizes that Distribution Facilities Upgrades may require acquisition of land interests, which may require individual agreements between the Company or its Affiliate and the landowners. The Interconnecting Customer agrees to pay to the Company all reasonable costs incurred by it or its Affiliate associated with these acquisition agreements in advance of their execution. The Company

reserves the right to draft any and all documents creating land interests that it will receive to effectuate interconnection service under this Interconnection Requirements Document.

In the event the Interconnecting Customer acquires the land, permits, licenses, franchises or regulatory or other approvals necessary for the construction and operation of the Distribution Facilities Upgrades, the Company has the right, at Interconnecting Customer's expense, to approve or reject any terms and conditions related thereto prior to the start of service.

## **6.0 Distribution Facilities Upgrades Charge**

If Distribution Facilities Upgrades are required to accommodate installation of the Facility, the Interconnecting Customer shall be required to pay a Distribution Facilities Upgrades Charge. Such charge may be billed as an incremental monthly charge based upon the total costs of the facilities upgrade, with the total upgrade cost amortized over three years. The Interconnecting Customer also has the option of paying the total Distribution Facilities Upgrades Charge prior to interconnection. In the event that other customers of the Company are served by the upgraded facilities at the time the upgrade is implemented, the Interconnecting Customer shall pay its allocated share of the Distribution Facilities Upgrades Charge.

## **7.0 Delivery and Measurement of Electricity**

**7.1 Voltage Level:** All electricity across the Interconnection Point shall be in the form of single-phase or three-phase sixty-hertz alternating current at a voltage class determined by mutual agreement of the Parties.

### **7.2 Machine Reactive Capability**

**7.2.1 Category 1, 2, 3 and 4 Facilities:** Category 1, 2, 3 or 4 Facilities will not be required to provide reactive capability.

**7.2.2 Category 5 Facilities:** Each Category 5 Facility interconnected with the Company's Distribution System shall be required to provide reactive capability to regulate and maintain system voltage at the Interconnection Point. The Company and NEPOOL shall establish a scheduled range of voltages to be maintained by the Facility. The reactive capability requirements shall be reviewed as part of the Distribution Facility Impact Study and Distribution Facility Detailed Study.

**7.3 Metering, Related Equipment and Billing Options:** The Company shall furnish, read and maintain all revenue metering equipment. Except as provided below, the Company shall own the meter and the Interconnecting Customer shall pay to the Company a monthly charge to cover taxes, meter maintenance, incremental reading and billing costs, the allowable return on the invoice cost of the meter and the depreciation of the meter. These charges are set forth in Schedule B of the Company's Qualifying Facility Power Purchase Rate P, M. D. T. E. No. 1032-C, as amended from time to time. If the Facility is a Qualifying Facility or On-Site Generating Facility the Interconnecting Customer may elect to own the meter, in which case, the Interconnecting Customer shall pay to the Company a monthly charge to cover meter maintenance and incremental reading and billing costs. These charges are set forth in Schedule B of the Company's Qualifying Facility Power Purchase Rate P, as amended from time to time.

The Interconnecting Customer shall provide suitable space within the Facility for installation of the metering, telemetering and communication equipment at no cost to the Company.

The Interconnecting Customer shall be responsible for purchasing and installing software, hardware and/or other technology that may be required by the Company to read billing meters.

All metering equipment installed pursuant to this Interconnection Requirements Document and associated with the Facility shall be routinely tested by the Company at Interconnecting Customer's expense, in accordance with applicable Company and/or ISO-New

England criteria, rules and standards. If, at any time, any metering equipment is found to be inaccurate by a margin greater than that allowed under applicable criteria, rules and standards, the Company shall cause such metering equipment to be made accurate or replaced. The cost to repair or replace the meter shall be borne by the Company, if the Company owns the meter, or by the Interconnecting Customer if the Interconnecting Customer owns the meter. Meter readings for the period of inaccuracy shall be adjusted so far as the same can be reasonably ascertained; provided, however, no adjustment prior to the beginning of the preceding month shall be made except by agreement of the Parties. Each party shall comply with any reasonable request of the other concerning the sealing of meters, the presence of a representative of the other party when the seals are broken and the tests are made, and other matters affecting the accuracy of the measurement of electricity delivered from the Facility. If either party believes that there has been a meter failure or stoppage, it shall immediately notify the other.

If the Metering Point and the Point of Receipt or Point of Delivery are not at the same location, the metering equipment shall record delivery of electricity in a manner that accounts for losses occurring between the Metering Point and the Point of Receipt or Point of Delivery. Losses between the Metering Point and Point of Receipt will be reflected pursuant to applicable Company, NEPOOL or ISO-New England criteria, rules or standards.

The type of metering equipment to be installed at a Facility is dependent on the Category (size) of the facility and how and to whom the net Facility output will be sold. The available equipment options and associated requirements are:

- Net Metering – in which a standard distribution class meter is installed and is enabled to run in a normal direction during periods of net consumption and to run backwards during periods of net generator output. All metering equipment included in this type of installation, including self-contained meters and instrument transformers and meters, shall meet ANSI



~~0.3%~~C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers.

- Bi-directional, non-interval meter without remote access – in which a distribution class meter with multiple registers is installed. One set of registers will record energy flows from the Company to the Facility during periods when the Facility is a net consumer of energy (the other register will record no flow during these periods) and a second set of registers will flow energy flows from the Facility to the Company during periods when the Facility is a net producer of energy (the other register will record no flow during these periods). Each set of registers will record total flows only and will not record flows during specific intervals. All metering equipment included in this type of installation, including self-contained meters and instrument transformers and meters, shall meet ANSI ~~0.3%~~C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers.
- Bi-directional, interval meter with remote access – in which a distribution class meter with multiple registers is installed. One set of registers will record energy flows from the Company to the Facility during periods when the Facility is a net consumer of energy (the other register will record no flow during these periods) and a second set of registers will flow energy flows from the Facility to the Company during periods when the Facility is a net producer of energy (the other register will record no flow during these periods). Each set of registers will record total flows as well as flows during hourly intervals. In addition, the meters will be equipped with remote access capability that may include telemetering to the extent required by applicable NEPOOL standards. All metering equipment included in this type of installation shall meet the requirements contained in NEPOOL Operating Procedure No. 18, “Metering and Telemetering Criteria” and the Company’s “Policy and Practices for Metering and Telemetering Requirements for New or Modified Interconnections”. Copies of both publications are available

from the Company upon request. The Interconnecting Customer shall be responsible for providing all necessary leased telephone lines and any necessary protection for leased lines and shall furthermore be responsible for all communication required by ISO-New England, or by ISO-New England's designated satellite. The Interconnecting Customer shall maintain all telemetering and transducer equipment at the Facility in accordance with ISO-New England criteria, rules and standards. The Company will purchase, own and maintain all telemetering equipment located on the Interconnecting Customer's facilities, if the Interconnecting Customer desires, at the Interconnecting Customer's expense. The Interconnecting Customer shall provide, install and own Company-approved or Company-specified test switches in the transducer circuits.

**7.3.1 Category 1 and 2 Facilities:** Unless the Interconnecting Customer elects another form of metering, Category 1 and 2 Facilities will be equipped with Net Metering.

**7.3.2 Category 3 and 4 Facilities:** Category 3 and 4 Facilities shall not be entitled to utilize Net Metering. Category 3 and 4 Facilities will be equipped with a bi-directional, non-interval meter without remote access; provided, however a bi-directional, interval meter with remote access shall be installed if the Interconnecting Customers elects to install such meter at its expense or the sale of energy from the Facility requires such a meter (such as in the case of a sale from the Facility to the NEPOOL markets or to a third party).

**7.3.3 Category 5 Facilities:** Category 5 Facilities shall only be equipped with bi-directional, interval meters with remote access. In addition, Category 5 Facilities which are 5 MW or greater are required by NEPOOL Operating Procedure No. 18 to provide telemetering equipment and to supply accurate and reliable information to system operators regarding metered values for MW, MVAR, volt, amp, frequency,

breaker status and all other information deemed necessary by ISO-NE and the NEPOOL Satellite (REMVEC).

**8.0 Notice Provisions:** If at any time, in the reasonable exercise of the Company's judgment, operation of the Facility adversely affects the quality of service to the Company's customers or interferes with the safe and reliable operation of the Distribution System, the Company may discontinue interconnection service to the Interconnecting Customer until the condition has been corrected. Unless an emergency exists or the risk of one is imminent, the Company shall give Interconnecting Customer reasonable notice of its intention to discontinue service and, where practical, allow suitable time for Interconnecting Customer to remedy the offending condition. The Company's judgment with regard to discontinuance of deliveries or disconnection of facilities under this paragraph shall be made in accordance with Good Utility Practice. In the case of such discontinuance, the Company shall immediately confer with Interconnecting Customer regarding the conditions causing such discontinuance and its recommendation concerning the timely correction thereof.

**9.0 Access and Control:** Properly accredited representatives of the Company or its Affiliate shall at all reasonable times have access to the Facility to make reasonable inspections and obtain information required in connection with this Interconnection Requirements Document. At the Facility, such representatives shall make themselves known to the Interconnecting Customer's personnel, state the object of their visit, and conduct themselves in a manner that will not interfere with the construction or operation of the Facility. The Company or its Designated Agent will have control such that it may open or close the circuit breaker or disconnect and place safety grounds at the Point of Receipt, Point of Delivery, or at the station if the Point of Delivery is remote from the station.

## **10.0 Force Majeure and Indemnification**

**10.1 Force Majeure:** An event of Force Majeure means any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, any curtailment, order, regulation or restriction imposed by governmental, military or lawfully established civilian authorities, or any other cause beyond either party's control. A Force Majeure event does not include an act of negligence or intentional wrongdoing. Neither the Company nor the Interconnecting Customer will be considered in default as to any obligation under this Interconnection Requirements Document if prevented from fulfilling the obligation due to an event of Force Majeure. However, a party whose performance is hindered by an event of Force Majeure shall make all reasonable efforts to perform its obligations under this Interconnection Requirements Document.

**10.2 Indemnification:** The Interconnecting Customer shall at all times indemnify, defend, and save the Company harmless from any and all damages, losses, claims, including claims and actions relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the Company's performance of its obligations under this Interconnection Requirements Document on behalf of the Interconnecting Customer, except in cases of gross negligence or intentional wrongdoing by the Company.

**10.3 Insurance:** For Category 2 Facilities, except Category 2 Facilities that are Net Metered, and all Category 3, 4 and 5 Facilities, the Interconnecting Customer shall be required to provide and maintain insurance coverage as described in Exhibit 6, attached hereto and incorporated by reference.

Effective: ~~September 1, 2001~~ March 1, 2002

**EXHIBIT 1**

**NOTICE OF INTENT TO INTERCONNECT**

The following information must be provided with the Interconnecting Customer's Notice of Intent to Interconnect:

- a) The name and address of the Interconnecting Customer and location of the generating facility;
- b) A brief description of the generating facility, including a statement indicating whether the generating facility is a small power production facility or cogeneration facility;
- c) The primary energy source used or to be used by the generating facility;
- d) The power production capacity of the generating facility and the maximum net capacity that may be delivered to the Company's system;
- e) The owners of the generating facility, including the percentage ownership by any electric utility or public utility holding company, or by any entity owned by either;
- f) The expected date of installation and the anticipated on-line date;
- g) The anticipated purchaser of the output of excess output of the generating facility (the Company or other third party) and the anticipated form (simultaneous purchase and sale, net purchase and sale, net metering, or other method);
- h) A description of any power conditioning equipment to be located between the generating facility and the Company's system;
- i) A description of the type of generator used in the generating facility installation (synchronous, induction, photovoltaic, or other).

To the extent practical, the above information may be submitted using the accompanying form.

### NOTICE OF INTENT TO INTERCONNECT

APPLICANT		TELEPHONE #		DATE	
STREET (MAILING) ADDRESS			CITY, STATE & ZIP CODE		
FACILITY LOCATION (IF NOT ADDRESS ABOVE)			CITY, STATE & ZIP CODE		
UTILITY PROVIDING SERVICE			ACCOUNT NUMBER		
ENERGY SOURCE	PEAK POWER RATING-KW	INVERTER TYPE <sup>1</sup> (if applicable)		GENERATOR TYPE <sup>2</sup> (if applicable)	
<p>1. Only inverters meeting IEEE Standard 929-2000 and UL Standard 1741 are qualified for interconnection. The Company will determine from this application if your inverter is qualified and contact you.</p> <p>2. Any rotating generator requires protective equipment at the point of interconnection. If you have this type of generator, the Company will contact you regarding required equipment based upon this application.</p>					
If an ownership connection exists between the applicant and this utility or National Grid USA, please provide details below and on the back of this form.					
ESTIMATED INSTALLATION DATE			ESTIMATED OPERATION DATE		
<p>If the generating facility is rated at 60 KW or less you are eligible for monthly net energy billing.</p> <p>If eligible, do you request single-meter net energy billing/sales? YES ____ NO ____</p>					

I hereby certify that, to the best of my knowledge, all of the information provided in this Notice is true.

Signature of Applicant \_\_\_\_\_

### EXHIBIT 2 Interconnection Service Agreement

- 1.0 This Interconnection Service Agreement, dated as of \_\_\_\_\_ is entered into, by and between either Massachusetts Electric Company or the Nantucket Electric Company, as appropriate, (hereinafter referred to as the “Company”), and \_\_\_\_\_ (“Interconnecting Customer”).
- 2.0 The Interconnecting Customer has been determined by the Company to have tendered a Notice of Intent to Interconnect, pursuant to 220 C.M.R. ' 8.04 to interconnect the Facility described in Attachment 1.
- 3.0 The Company agrees to provide and the Interconnecting Customer agrees to take and pay for Interconnection Service in accordance with the provisions of the Company’s Interconnection Requirements Document, as may be amended from time to time, this Interconnection Service Agreement, and any Attachments to this Interconnection Service Agreement.
- 4.0 The Interconnecting Customer agrees at all times to operate and maintain the Facility in accordance with the requirements of the Company’s Interconnection Requirements Document.
- 5.0 The Company agrees to construct the Distribution Facilities Upgrades identified in Attachment 2 that are required to accommodate the interconnection of the Facility to the Company’s Distribution System. The Interconnecting Customer agrees to pay to the Company the amounts shown in Attachment 3 for the construction of the Distribution Facilities Upgrades.
- 6.0 The Interconnecting Customer has elected to (initial one) ( ) own ( ) have the Company own the associated meter and agrees, in addition to the amounts specified in paragraph 5 above, to pay to the Company each month the applicable metering charge as set forth in the Company’s P-Rate, as approved by the Massachusetts Department of Telecommunications and Energy from time to time.
- 7.0 Any notice or request made to or by either party regarding this Interconnection Service Agreement shall be made to the representative of the other party as indicated below:

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
Exhibit 2  
Sheet 23

Nantucket Electric Company  
Massachusetts Electric Company  
55 Bearfoot Road  
Northborough, MA 01532  
Attn: Senior Vice President – Business Services

Interconnecting Customer:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8.0 The Terms and Conditions for Distribution Service, where not in conflict with the terms hereof, are incorporated herein and made a part hereof.

IN WITNESS WHEREOF, the parties have caused this Interconnection Service Agreement to be executed by their respective authorized officials.

Nantucket Electric Company \_\_\_\_: or Massachusetts Electric Company \_\_\_\_:

By: \_\_\_\_\_  
Name Title Date

Interconnecting Customer:

By: \_\_\_\_\_  
Name Title Date



Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
Exhibit 2  
Sheet 24

Attachment 1

Description of Facilities

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
Exhibit 2  
Sheet 25

Attachment 2

Distribution Facilities Upgrades

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
Exhibit 2  
Sheet 26

Attachment 3

Costs for the Construction of the Distribution Facilities Upgrades

### EXHIBIT 3

#### **Policy and Practices for Protection Requirements For New or Modified Generation Interconnections with the Distribution System**

Any Facility desiring to interconnect with the Company's Distribution System or modify an existing interconnection must meet the technical specifications and requirements set forth in this Protection Policy. Once interconnected, the Company, in keeping with Good Utility Practice and in its sole discretion, may disconnect from the Facility if the Facility deviates from the technical specifications and requirements contained in this Protection Policy. The Facility must return to full compliance with this Protection Policy prior to reconnecting with the Company's system.

The specifications and requirements listed herein are intended solely to mitigate possible adverse impacts caused by the Facility on the Company's equipment and on other customers of the Company. They are not intended to address protection of the Facility itself or its internal load. It is the responsibility of the Facility to comply with the requirements of all appropriate standards, codes, statutes and authorities to protect itself and its loads.

To determine the protection requirements for a given Facility, the following Categories have been established:

Category	Maximum Output (kW)
1	$\leq 10$
2	$> 10$ and $\leq 60$
3	$> 60$ and $\leq 300$
4	$> 300$ and $\leq 1,000$
5	$> 1,000$

## **I Protection Requirements**

### **Category 1 Facilities**

#### **General Requirements:**

If, due to the interconnection of the Facility, when combined with preexisting facilities interconnected to the Company's system, the rating of any of the Company's equipment or the equipment of others connected to the Company's system will be exceeded or its control function will be adversely affected, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of equipment to eliminate the condition. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

#### **Requirements for Inverter-based (Type A) installations:**

- a. The Company's distribution circuits generally operate with automatic reclosing following a trip with automatic reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Facility is responsible for protecting its equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation.
- b. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Company's approving the Interconnecting Customer's request for interconnection:
  - An electrical one-line diagram or sketch depicting how the inverter will be interconnected relative to the service entrance panel and the electric meter.

- The make, model and manufacturer's specification sheet for the inverter.
- c. For Facilities that utilize photovoltaic technology, it is ~~recommended~~required that the system be installed in compliance with IEEE Standard 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems". The inverter shall meet the Underwriters Laboratories Inc. Standard UL 1741, ~~A~~Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems". Based on the information supplied by the Interconnecting Customer, if the Company determines the inverter is in compliance with UL 1741, the Interconnecting Customer's request for interconnection will be approved without the need to conduct a Distribution Facilities Impact Study or a Distribution Facilities Detailed Study.
- d. For Facilities that utilize wind technology or other direct current energy sources and employ inverters for production of alternating current, the inverter shall meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems". Based on the information supplied by the Interconnecting Customer, if the Company determines the inverter is in compliance with UL 1741 the Interconnecting Customer's request for interconnection will be approved without the need to conduct a Distribution Facilities Impact Study or a Distribution Facilities Detailed Study.

**Requirements for Induction Generator (Type B) installations:**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
  - Three copies of a Facility one-line drawing.
  - Three copies of a one-line drawing showing the relays, if required herein, and metering including current transformer ("CT") and voltage transformer ("VT")

connections and ratios.

- Three copies of a three-line drawing for three phase units or a two-line drawing for single phase units showing the AC connections to the relays, if required herein, and meters.
  - The generator nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed and locked rotor current.
  - If the Facility owns the transformer between the Company and the Facility, the generator step up transformer nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.
  - A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.
  - Schematic drawings showing the control circuits for the interconnection breaker(s) or contactor(s).
  - Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
  - The proposed grounding method for the stator winding of the generator.
  - Other information that may be determined by the Company as required for a specific interconnection.
- b. The Interconnecting Customer must submit to the Company relay settings for all Facility protective relays that affect the interconnection with the Company's system at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c. A Facility using induction generator(s) connected in the vicinity of capacitance sufficient to self-excite the generator(s) must meet the requirements for synchronous machines of the same Category. The capacitors that enable self-excitation may actually be external to

the Facility and may belong to the Company or to other customers of the Company. The Company will not restrict the existing or future application of capacitors on its lines nor restrict their use by other customers to accommodate a Facility with induction machines.

- d. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements for synchronous machines if self-excitation becomes possible even if not initially possible.
- e. A circuit breaker or contactor shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker" or "Interconnection Contactor"). If there is more than one Interconnection Breaker or Interconnection Contactor, the requirements of this Protection Policy shall apply to each one individually.
- f. The Company will review the relay settings as submitted to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Facility shall be responsible for protection of its system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.
- g. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- h. In general, across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting



of similar sized motors. If an Interconnection Breaker or latching type contactor is to be tripped by protective relays to satisfy this Protection Policy, then the Interconnection Breaker or Interconnection Contactor control circuits shall be DC powered from a station battery or Company-approved equivalent.

- i. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like shall be used in this logic.
- j. The Facility shall provide a disconnect switch at the interconnection point with the Company that is accessible to Company personnel at all times that can be opened for isolation. The Company shall have the right to open this disconnect switch during emergency conditions or with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.
- k. Where protective relays are required by this Protection Policy, their control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery. If the Facility uses a non-latching interconnection contactor, AC powered relaying satisfying the requirements of this Protection Policy may be allowed provided the relay and its method of application is fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay will immediately trip the generator by opening the coil circuit of the Interconnection Contactor.
- l. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault

conditions.

- m. If the interconnection voltage requires, a voltage transformer shall be provided by the Facility and shall be connected to the Company side of the Interconnecting Breaker or Interconnecting Contactor. The voltage from this VT shall be used in the interlock as specified above. For three phase applications, a VT for each phase is required.
- n. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacturer and type generally accepted for use by the Company.
- o. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- p. Tripping by protective relays required to satisfy this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- p. On three phase installations where voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company, the unit shall be tripped.
- q. The Facility shall provide an undervoltage relay sensing voltage, preferably on the Company's side of the Interconnection Breaker or Interconnection Contactor, which trips the Interconnection Breaker or Interconnection Contactor; provided, however, for single phase units, an undervoltage relay is not required, provided the generator is interconnected through a non-latching contactor whose coil is held by AC voltage from the Company's side of the contactor such that the contactor drops out and will not close in the absence of Company voltage.

**Requirements for Synchronous Generator (Type C) installations:**

Category 1 Facilities utilizing synchronous generators shall meet all the requirements that are

applicable to synchronous generators for Category 2, 3, 4 and 5 Facilities.

## Category 2 Facilities

**General Requirements:** The Facility shall provide a disconnect switch at the interconnection point with the Company that can be opened for isolation. The switch shall be in a location accessible to Company personnel at all times. The Company shall have the right to open this disconnect switch during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a type generally accepted for use by the Company.

### Requirements for Inverter-based (Type A) installations:

- a. The Company's distribution circuits generally operate with automatic reclosing following a trip with automatic reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Facility is responsible for protecting its equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation.
- b. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Company's approving the Interconnecting Customer's request for interconnection:
  - c. An electrical one line diagram or sketch depicting how the inverter will be interconnected relative to the service entrance panel and the electric meter.
  - c. The make, model and manufacturer's specification sheet for the inverter.

- c. For Facilities that utilize photovoltaic technology, it is ~~recommended~~required that the system be installed in compliance with IEEE Standard 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems". It is required that the inverter meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems".
- d. For Facilities that utilize wind technology, fuel cell technology or other inverter-based systems, the inverter must meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems".

**Requirements for Induction Generator (Type B) installations:**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
  - Three copies of a Facility one-line drawing.
  - Three copies of a one-line drawing showing the relays, if required herein, and metering including current transformer ("CT") and voltage transformer ("VT") connections and ratios.
  - Three copies of a three-line drawing for three phase units or a two-line drawing for single phase units showing the AC connections to the relays, if required herein, and meters.
  - The generator nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed and locked rotor current.
  - If the Facility owns the transformer between the Company and the Facility, the generator step up transformer nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.

- A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.
  - Schematic drawings showing the control circuits for the interconnection breaker(s) or contactor(s).
  - Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
  - The proposed grounding method for the stator winding of the generator.
  - Other information that may be determined by the Company as required for a specific interconnection.
- b. Relay settings for all Facility protective relays that affect the interconnection with the Company's system must be submitted at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c. A Facility using induction generator(s) connected in the vicinity of capacitance sufficient to self-excite the generator(s) must meet the requirements for synchronous machines of the same Category. The capacitors that enable self-excitation may actually be external to the Facility and may belong to the Company or to other customers of the Company. The Company will not restrict the existing or future application of capacitors on its lines nor restrict their use by other customers to accommodate a Facility with induction machines.
- d. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements for synchronous machines if self-excitation becomes possible even if not initially possible.
- e. A circuit breaker or contactor shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker" or "Interconnection Contactor"). If there is more than one Interconnection Breaker or Interconnection Contactor, the requirements of this Protection Policy shall apply to each one individually.

- f. The Company will review the relay settings as submitted by the Interconnecting Customer to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Facility shall be responsible for protection of its system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.
- g. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- h. In general, across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting of similar sized motors. If an Interconnection Breaker or latching type contactor is to be tripped by protective relays to satisfy the requirements of this Protection Policy, then the Interconnection Breaker or Interconnection Contactor control circuits shall be DC powered from a station battery or Company-approved equivalent.
- i. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like shall be used in this logic.

- j. The Facility shall provide a disconnect switch at the interconnection point with the Company that is accessible to Company personnel at all times that can be opened for isolation. The Company shall have the right to open this disconnect switch during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.
- k. Where protective relays are required by this Protection Policy, their control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery. If the Facility uses a non-latching interconnection contactor, AC powered relaying satisfying the requirements of this Protection Policy may be allowed provided the relay and its method of application is fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay will immediately trip the generator by opening the coil circuit of the Interconnection Contactor.
- l. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault conditions.
- m. If the interconnection voltage requires, a voltage transformer shall be provided by the Facility and shall be connected to the Company side of the interconnecting breaker or contactor. The voltage from this VT shall be used in the interlock as specified above. For three phase applications, a VT for each phase is required.
- n. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacturer and type generally accepted for use by the Company.

- o. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- p. Tripping by protective relays required to satisfy the requirements of this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- q. On three phase installations where voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company, the unit shall be tripped.
- r. The Facility shall provide an undervoltage relay sensing voltage, preferably on the Company's side of the interconnection breaker or contactor, which trips the interconnection breaker or contactor.

**Requirements for Synchronous Generator (Type C) installations:**

Category 2 Facilities utilizing synchronous generators shall meet all the requirements that are applicable to synchronous generators for Category 3, 4 and 5 Facilities.

**CATEGORY 3, 4 and 5 Facilities**

**Protection related information**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
  - P Three copies of a station one-line drawing.
  - P Three copies of a one-line drawing showing the relays and metering including current transformer (CT) and voltage transformer (VT) connections and ratios.



- P** Three copies of a three-line drawing showing the AC connections to the relays and meters.
- P** If the Facility is a synchronous generator, the nameplate information including rated voltage, rated current, rated kVA and power factor plus transient, sub-transient and synchronous impedances and zero sequence impedance.
- P** If the Facility is an induction generator, the nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed, locked rotor current, stator reactance, stator resistance, rotor reactance, rotor resistance and magnetizing reactance.
- P** If the Facility owns the transformer between the Company and the Facility, the nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.
- A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.
- P** Schematic drawings showing the control circuits for the interconnection breaker(s) and synchronizing breaker(s).
- P** Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
- P** Interconnection breaker operating time if it is tripped by protective relays required by this Protection Policy.
- P** The proposed grounding method for the stator winding.
- P** Other information that may be determined by the Company as required for a specific interconnection.

- b. Relay settings for all Facility protective relays that affect the interconnection with the Company's system must be submitted at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c. If, due to the interconnection of the Facility to the line, the fault interrupting, continuous, momentary or other rating of any of the Company's equipment or the equipment of other customers connected to the Company's system is exceeded, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of equipment to eliminate the condition. Likewise, when the proposed interconnection may result in reversed load flow through the Company's load tap changing transformer(s), line voltage regulator(s) or secondary network protector(s), control modifications necessary to mitigate the effects may be made to these devices by the Company at the Interconnecting Customer's expense or the Facility may be required to limit its output so reverse load flow cannot occur or to provide reverse power relaying that trips the Facility. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

### **Protection requirements**

- a. A circuit breaker shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker"). If there is more than one Interconnection Breaker, the requirements of this Protection Policy apply to each one individually.
- b. The Interconnecting Customer shall designate one or more breakers to be used to synchronize the Facility's generator to the Company's system. This "synchronizing breaker" could be a breaker other than the Interconnection Breaker. In some induction generator applications a contactor may serve this function.

- c. The Company's lines generally have automatic reclosing following a trip with reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Interconnecting Customer is responsible for protecting the Facility's equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation. The Interconnecting Customer may choose to install additional equipment such as direct transfer tripping from the Company's station(s) to insure the Facility is off the line prior to the line reclosing. However this option is not feasible in all cases, particularly where the Company uses pole-mounted reclosers between its substation and the Facility.
- d. The Company will review the relay settings as submitted by the Interconnecting Customer to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Interconnecting Customer shall be responsible for protection of the Facility's system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.
- e. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company also reserves the right to specify if and how the generator stator is to be grounded. The Facility will be responsible for procuring its equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- f. Across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting of similar sized motors.

### **Protection equipment requirements**

- a. Where the Interconnection Breaker (or Interconnection Contactor as may be the case with some smaller induction machines) is to be tripped by protective relays required to meet the requirements of this Protection Policy then the Interconnection Breaker (or Interconnection Contactor) control circuits shall be DC powered from a station battery.
- b. The synchronizing breaker(s) must be capable of withstanding at least twice rated system voltage and must be capable of interrupting the current produced when the Facility is connected out of phase with the Company's system.
- c. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the synchronizing breaker, Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like is to be used in this logic.
- d. The Facility shall be equipped with a switch at the interconnection point with the Company that can be opened for isolation. The Company shall have the right to open the interconnection during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.
- e. Protective relaying control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery.

- f. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault conditions.
- g. The Facility shall be equipped with a voltage transformer, connected to the Company side of the interconnecting breaker. The voltage from this VT shall be used in the interlock as specified in this Protection Policy. If the Facility's step up transformer is ungrounded at the Company voltage, this VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on the Company's side of the Facility's step up transformer, rated for phase-to-phase voltage and provided with two secondary windings. One winding shall be connected in open delta, have a loading resistor to prevent ferroresonance, and be used for the relay specified in this Protection Policy.
- h. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacture and type generally accepted for use by the Company.
- i. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- j. Protective relays utilized by the Facility as required per this Protection Policy shall be sufficiently redundant and functionally separate so as to provide adequate protection, as determined by the Company, upon the failure of any one component. The use of a single all-inclusive relay package is not acceptable.
- k. The Company may require the Facility to be equipped with two independent, redundant relaying systems in accordance with NPCC criteria for the protection of the bulk power system if the interconnection is to the bulk power system or if it is determined that delayed clearing of faults within the Facility adversely affects the bulk power system.
- l. A direct transfer tripping system, if one is required by either the Interconnecting Customer or by the Company, shall use equipment generally accepted for use by the Company and shall, at the option of the Company, use dual channels.

- m. Tripping by protective relays required to satisfy the requirements of this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- n. On three phase installations when voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company the unit shall be tripped.

#### **Requirements for Induction Generator (Type B) installations**

- a. A Facility using induction generators connected in the vicinity of capacitance sufficient to self-excite the generator(s) shall meet the requirements for synchronous machines in this Protection Policy. The capacitors that enable self-excitation may actually be external to the Facility. The Company will not restrict its existing or future application of capacitors on its lines nor restrict their use by other customers of the Company to accommodate a Facility with induction machines. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements for synchronous machines if self-excitation becomes possible, even if not initially possible.

The Facility may be required to install capacitors to limit the adverse effects of drawing reactive power from the system for excitation of the generator. Capacitors for supply of reactive power at or near the induction generator with a kVAR rating greater than 30% of the generator's kW rating may cause the generator to become self-excited. (If self-excitation can occur, the Facility shall be required to provide protection as specified in this Protection Policy for synchronous machines.)

- b. The Facility shall be equipped with the following relays for island detection supplied from a voltage transformer that may be connected to either the generator or Company voltage:

	<u>minimum setting range</u>	<u>minimum time delay range</u>
C overfrequency	60 - 62Hz	.1 - 2 secs
C underfrequency	60 - 58Hz	.1 - 2 secs
C overvoltage	105 - 115% normal	.1 - 4 secs
C undervoltage	85 - 95% normal	.1 - 4 secs

- c. During system conditions where local area load exceeds system generation, NPCC Emergency Operation Criteria requires a program of phased automatic underfrequency load shedding of up to 25% of area load to assist in arresting frequency decay and to minimize the possibility of system collapse. Depending on the point of connection of the Facility to the Company's system and in conformance with the NPCC Emergency Operating Criteria, the Facility may be required to remain connected to the system during the frequency decline to allow the objectives of the automatic load shedding program to be achieved, or to otherwise provide compensatory load reduction, equivalent to the Facility's generation lost to the system, if the Interconnecting Customer elects to disconnect the Facility at a higher underfrequency set point.

#### **Requirements for Synchronous Generator (Type C) installations**

- a. A synchronous generator is a source of current for faults occurring on the Company's line(s). The Facility must be equipped with protective relays to detect any faults, whether phase-to-phase or phase-to-ground, on the Company's line(s) or within the Facility, and

isolate the Facility from the Company's line(s) such that the following criteria are met, as determined by the Company:

- Ⓒ The existing sensitivity of fault detection is not substantially degraded.
- Ⓒ The existing speed of fault clearing is not substantially degraded.
- Ⓒ The coordination margin between relays is not substantially reduced.
- Ⓒ The sustained unfaulted phase voltage during a line-to-ground fault is not increased beyond the design value for the existing system insulation levels and overvoltage protection.
- Ⓒ Non-directional line relays will not operate for faults external to the line due to the Facility's contribution.
- Ⓒ Proper settings for existing relays are achievable within their ranges.

The Company may perform engineering studies to evaluate the Facility's protection compliance with respect to the above and may make recommendations to the Interconnecting Customer on methods to achieve compliance. If, due to the interconnection of the Facility to the Company's system, any of the above criteria is violated for the Company's facilities or for the facilities of others connected to the Company's system, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of protective equipment to eliminate the violation and restore the level of protection existing prior to the interconnection. This may include the addition of pilot relaying systems involving communications between all terminals. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

- b.** The Interconnecting Customer is responsible for procuring any communications channels necessary between the Facility and the Company's stations and for providing protection from transients and overvoltages at all ends of these communication channels. The



Interconnecting Customer will also bear the ongoing cost to lease these communication channels.

- c. If the Facility's step up transformer connection is ungrounded, the Facility shall be equipped with a zero sequence overvoltage relay fed from the open delta of the three phase VT specified in this Protection Policy.
- d. The Facility shall be equipped to provide protection to limit sustained abnormal frequency and/or voltage conditions to the Company's customers directly supplied from the interconnection circuit should the Facility and its interconnection circuit become isolated from the Company's system. The protection can consist of either the following relays supplied from a voltage transformer connected to either the generator or the Company's voltage or other means if the Facility can demonstrate sufficient control of abnormal frequency and voltage excursions as seen by the Company's customers:

	<u>minimum setting range</u>	<u>minimum time delay range</u>
C overfrequency	60 - 62Hz	.1 - 2 secs
C underfrequency	60 - 56Hz	.5 - 30 secs
C overvoltage	105 - 115% normal	.1 - 4 secs
C undervoltage	85 - 95% normal	.1 - 4 secs

- e. During system conditions where local area load exceeds system generation, NPCC Emergency Operation Criteria requires a program of phased automatic underfrequency load shedding of up to 25% of area load to assist in arresting frequency decay and to minimize the possibility of system collapse. Depending on the point of connection of the Facility to the Company's system and in conformance with the Emergency Operating Criteria, the Facility may be required to remain connected to the system during the frequency decline to allow the objectives of the automatic load shedding program to be achieved, or to otherwise provide compensatory load reduction, equivalent to the

Facility's generation lost to the system, if the Interconnecting Customer elects to disconnect the Facility at a higher underfrequency set point.

- e. The Facility may be required to use high-speed protection if time-delayed protection would result in degradation in the existing sensitivity or speed of the protection systems on the Company's lines.
- g. The Facility may be required to be equipped to provide local breaker failure protection which may include direct transfer tripping to the Company's line terminal(s) in order to detect and clear faults within the Facility that cannot be detected by the Company's back-up protection.
- h. The Facility shall be equipped to provide protective relaying to prevent the closing of the synchronizing breaker(s) while the Facility's generation is out-of-synchronization with the Company's system.

## **II Protection System Testing and Maintenance**

The Company shall have the right to witness the testing of selected protective relays and control circuits at the completion of construction and to receive a copy of all test data.

The Interconnecting Customer shall provide the Company with at least a one week notice prior to the final scheduling of these tests. Testing shall consist of:

- C CT and CT circuit polarity, ratio, insulation, excitation, continuity and burden tests.
- C VT and VT circuit polarity, ratio, insulation and continuity tests.
- C Relay pick-up and time delay tests.
- C Functional breaker trip tests from protective relays.
- C Relay in-service test to check for proper phase rotation and magnitudes of applied currents and voltages.
- C Breaker closing interlock tests.
- C Paralleling and de-paralleling operation.

- C Other relay commissioning tests typically performed for the relay types involved.
- C An inverter with field adjustable settings for its internal protective elements shall be tested to verify these settings if those internal elements are being used by the Facility to satisfy the requirements of this Protection Policy . The Facility shall be equipped with whatever equipment is required to perform this test. If a Asimulated utility@is required to perform such testing the Company is unable to provide the equipment required to perform the test.

The protective relays shall be tested and maintained by the Interconnecting Customer on a periodic basis but not less than once every four years or as otherwise determined by the Company. For relays installed in accordance with the NPCC Criteria for the Protection of the Bulk Power System, maintenance intervals shall be in accordance with such criteria. The results of these tests shall be summarized by the Interconnecting Customer and reported in writing to the Company.

Inverters with field adjustable settings for their internal protective elements shall be periodically tested if those internal elements are being used by the Facility to satisfy the requirements of this Protection Policy. If a Asimulated utility@is required to perform such testing the Company is unable to provide the equipment required to perform the test.

In its sole discretion, the Company may waive all or some of these requirements.

### **III. Protection Requirements – Momentary Paralleling of Standby Generators**

Protective relays to isolate the Facility for faults in the Company's system are not required if the paralleling operation is automatic and takes place for less than one-half of a second.

Parallel operation of the Facility with the Company's system shall be prevented when the Company's line is dead or out of phase with the Facility.

The control scheme for automatic paralleling must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Facility being allowed to interconnect with the Company's system.

#### **IV. Protection System Changes**

The Interconnecting Customer must provide the Company with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. The Company will determine if such proposed changes require re-acceptance of the interconnection per the requirements of this Protection Policy.

In the future, should the Company implement changes to the system to which the Facility is interconnected, the Interconnecting Customer will be responsible at its own expense for identifying and incorporating any necessary changes to its protection system. These changes to the Facility's protection system are subject to review and approval by the Company.

In its sole discretion, the Company may waive all or some of these requirements.

## **EXHIBIT 4**

### **Form of Distribution Facilities Impact Study Agreement**

This Agreement dated \_\_\_\_\_, is entered into by  
(the Interconnecting Customer) and the Company, for the purpose of setting forth the terms,  
conditions and costs for conducting a Distribution Facilities Impact Study relative to  
\_\_\_\_\_.

1. The Interconnecting Customer agrees to provide, in a timely and complete manner, all required information and technical data necessary for the Company to conduct the Distribution Facilities Impact Study. The Interconnecting Customer understands that it must provide all such information and data prior to the Company's commencement of the Distribution Facilities Impact Study. Such information and technical data is specified in Attachment 1 to this Agreement.
2. All work pertaining to the Distribution Facilities Impact Study that is the subject of this Agreement will be approved and coordinated only through designated and authorized representatives of the Company and the Interconnecting Customer. Each party shall inform the other in writing of its designated and authorized representative.
3. The Company will advise the Interconnecting Customer of any additional studies as it may in its sole discretion deem necessary, in accordance with Good Utility Practice. The Company will not proceed with additional studies without the Interconnecting Customer's consent.
4. The Company contemplates that it will require [specify time] to complete the Distribution Facilities Impact Study. Upon completion of the Distribution Facilities Impact Study by

the Company, the Company will provide a Distribution Facilities Impact Study Report to the Interconnecting Customer based on the information provided and developed as a result of this effort. If, upon review of the Distribution Facilities Impact Study Report, the Interconnecting Customer decides to pursue its interconnection request, the Company will, at the Interconnecting Customer's direction, tender a Distribution Facilities Detailed Study Agreement within thirty (30) days if deemed additionally necessary by the Company. The Distribution Facilities Impact Study and Distribution Facilities Detailed Study, together with any additional studies contemplated in Paragraph 3, shall form the basis for the Interconnecting Customer's proposed use of the Company's Distribution System and shall be furthermore utilized in obtaining necessary third-party approvals of any required facilities and requested distribution services. The Interconnecting Customer understands and acknowledges that any use of study results by the Interconnecting Customer or its agents, whether in preliminary or final form, prior to NEPOOL 18.4 approval, should such approval be required, is completely at the Interconnecting Customer's risk and that the Company will not guarantee or warrant the completeness, validity or utility of study results prior to NEPOOL 18.4 approval.

5. The estimated costs contained within this Agreement are the Company's good faith estimate of its costs to perform the Distribution Facilities Impact Study contemplated by this Agreement. The Company's estimates do not include any estimates for wheeling charges that may be associated with the transmission of Facility output to third parties or with rates for station service. The actual costs charged to the Interconnecting Customer by the Company may change as set forth in this Agreement. Prepayment will be required for all study, analysis, and review work performed by the Company or its Affiliate, all of which will be billed by the Company to the Interconnecting Customer in accordance with Paragraph 6 of this Agreement.
6. The payment required is \$\_\_\_\_\_ from the Interconnecting Customer to the Company for the primary system analysis, coordination, and monitoring of the Distribution Facilities

Impact Study. Such amount shall be payable in full to the Company prior to the Company beginning the work. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increases for work to be performed if the total amount increases by 10% or more. Any such changes to the Company's costs for the study work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) days of the Company's notice of increase, either authorize such increases and make payment in the amount set forth in such notice, or the Company will suspend the Distribution Facilities Impact Study and this Agreement will terminate. Upon suspension of the Distribution Facilities Impact Study, the parties may petition the Massachusetts Department of Telecommunications and Energy, to review the cost increase, pursuant to 220 CMR 8.04(3).

In the event this Agreement is terminated for any reason, the Company shall refund to the Interconnecting Customer the portion of the above credit or any subsequent payment to the Company by the Interconnecting Customer that the Company did not expend or commit in performing its obligations under this Agreement. Any additional billings under this Agreement shall be subject to an interest charge computed in accordance with the provisions of the Interconnection Requirements Document. Payments for work performed shall not be subject to refunding except in accordance with Paragraph 7 below.

7. If the actual costs for the work exceed prepaid estimated costs, the Interconnecting Customer shall make payment to the Company for such actual costs within thirty (30) days of the date of the Company's invoice for such costs. If the actual costs for the work are less than those prepaid, the Company will credit such difference toward the Company costs unbilled, or in the event there will be no additional billed expenses, the amount of the overpayment will be returned to the Interconnecting Customer with interest computed as stated in Paragraph 6 of this Agreement, from the date of reconciliation.

8. Nothing in this Agreement shall be interpreted to give the Interconnecting Customer immediate rights to wheel over or interconnect with the Company's Distribution System.
9. Within one (1) year following the Company's issuance of a final bill under this Agreement, the Interconnecting Customer shall have the right to audit the Company's accounts and records at the offices where such accounts and records are maintained, during normal business hours; provided that appropriate notice shall have been given prior to any audit and provided that the audit shall be limited to those portions of such accounts and records that relate to service under this Agreement. The Company reserves the right to assess a reasonable fee to compensate for the use of its personnel time in assisting any inspection or audit of its books, records or accounts by the Interconnecting Customer or its Designated Agent.
10. The Interconnecting Customer agrees to indemnify and hold the Company and its affiliated companies and directors, officers, employees, and agents of each of them (collectively "Affiliates") harmless from and against any and all damages, costs (including attorney's fees), fines, penalties and liabilities, in tort, contract, or otherwise (collectively "Liabilities") resulting from claims of third parties arising, or claimed to have arisen as a result of any acts or omissions by the Company or its Affiliates under this Agreement. The Interconnecting Customer hereby waives recourse against the Company and its Affiliates for, and releases the Company and its Affiliates from, any and all Liabilities for or arising from damage to its property due to a performance under this Agreement by the Company or its Affiliates.
11. If either party materially breaches any of its covenants hereunder, the other party may terminate this Agreement by serving notice of same on the other party to this Agreement.
12. This agreement shall be construed and governed in accordance with the laws of the Commonwealth of Massachusetts and with 220 C.M.R. ' 8.00 et seq.



13. All amendments to this Agreement shall be in written form executed by both parties.
14. The terms and conditions of this Agreement shall be binding on the successors and assigns of either party.
15. This Agreement will remain in effect for a period of up to two years from its effective date as permitted by the Massachusetts Department of Telecommunications and Energy, and is subject to extension by mutual agreement. Either party may terminate this Agreement by thirty (30) days' notice except as is otherwise provided herein.

Interconnecting Customer:

The Company:

Name: \_\_\_\_\_

Name:

Title: \_\_\_\_\_

Title:

Date: \_\_\_\_\_

Date:

## **Attachment 1**

### **Information to be Provided to the Company by the Interconnecting Customer for the Distribution Facilities Impact Study**

*Note: For Category 1, 2 or 3 Facilities, the Company will accept the material requested in Exhibit 3 in lieu of the information requested in this attachment.*

#### **1.0 Facilities Identification**

- 1.1 Requested capability in MW and MVA; summer and winter
- 1.2 Site location and plot plan with clear geographical reference
- 1.3 Preliminary one-line diagram showing major equipment and extent of Interconnecting Customer
- 1.4 Auxiliary power system requirements
- 1.5 Back-up facilities such as standby generation or alternate supply sources

#### **2.0 Major Equipment**

- 2.1 Power transformer(s): rated voltage, MVA and BIL of each winding, LTC and or NLTC taps and range,  $Z_1$  (positive sequence) and  $Z_0$  (zero sequence) impedances, and winding connections. Provide normal, long-time emergency and short-time emergency thermal ratings.
- 2.2 Generator(s): rated MVA, speed and maximum and minimum MW output, reactive capability curves, open circuit saturation curve, power factor (V) curve, response (ramp) rates, H (inertia), D (speed damping), short circuit ratio,  $X_1$  (leakage),  $X_2$  (negative sequence), and  $X_0$  (zero sequence) reactances and other data:

	Direct Axis	Quadrature Axis
saturated synchronous reactance	$X_{dv}$	$X_{qv}$
unsaturated synchronous reactance	$X_{di}$	$X_{qi}$
saturated transient reactance	$X_{\bar{d}v}$	$X_{\bar{q}v}$
unsaturated transient reactance	$X_{\bar{d}i}$	$X_{\bar{q}i}$
saturated subtransient reactance	$X_{@dv}$	$X_{@qv}$
unsaturated subtransient reactance	$X_{@di}$	$X_{@qi}$
transient open-circuit time constraint	$T_{\bar{d}o}$	$T_{\bar{q}o}$
transient short-circuit time constraint	$T_{\bar{d}}$	$T_{\bar{q}}$
subtransient open-circuit time constraint	$T_{@do}$	$T_{@qo}$
subtransient short-circuit time constraint	$T_{@d}$	$T_{@q}$

- 2.3 Excitation system, power system stabilizer and governor: manufacturer's data in sufficient detail to allow modeling in transient stability simulations.
- 2.4 Prime mover: manufacturer's data in sufficient detail to allow modeling in transient stability simulations, if determined necessary.
- 2.5 Busses: rated voltage and ampacity (normal, long-time emergency and short-time emergency thermal ratings), conductor type and configuration.
- 2.6 Transmission lines: overhead line or underground cable rated voltage and impeached (normal, long-time emergency and short-time emergency thermal rates),  $Z_1$  (positive sequence) and  $Z_0$  (zero sequence) impedances, conductor type, configuration, length and termination points.

- 2.7 Motors greater than 150 kWh 3-phase or 50 kW single-phase: type (induction or synchronous), rated hp, speed, voltage and current, efficiency and power factor at 2, 3/4 and full load, stator reactance and reactance, rotor reactance and reactance, magnetizing reactance.
- 2.8 Circuit breakers and switches: rated voltage, interrupting time and continuous, interrupting and momentary currents. Provide normal, long-time emergency and short-time emergency thermal ratings.
- 2.9 Protective relays and systems: ANSI function number, quantity manufacturer's catalog number, range, descriptive bulletin, tripping diagram and three-line diagram showing AC connections to all relaying and metering.
- 2.10 CTs and VTs: location, quantity, rated voltage, current and ratio.
- 2.11 Surge protective devices: location, quantity, rated voltage and energy capability.
- 3.0 Other
  - 3.1 Additional data to perform the Distribution Facilities Impact Study will be provided by the Interconnecting Customer as requested by the Company.
  - 3.2 The Company reserves the right to require specific equipment settings or characteristics necessary to meet NEPOOL and NPCC criteria and standards.

## **EXHIBIT 5**

### **Form of Distribution Facilities Detailed Study Agreement**

This agreement dated \_\_\_\_\_, is entered into by  
(the Interconnecting Customer) and the Company for the purpose of setting forth the terms,  
conditions and costs for conducting a Distribution Facilities Detailed Study relative to  
\_\_\_\_\_. The Distribution Facilities Detailed Study will  
determine the detailed engineering, design and cost of the facilities necessary to satisfy the  
Interconnecting Customer's request for service interconnecting with the Company's Distribution  
System.

1. The Interconnecting Customer agrees to provide, in a timely and complete manner, all required information and technical data necessary for the Company to conduct the Distribution Facilities Detailed Study. Where such information and technical data was provided for the Distribution Facilities Impact Study, it should be reviewed and updated with current information, as required.
2. All work pertaining to the Distribution Facilities Detailed Study that is the subject of this Agreement will be approved and coordinated only through designated and authorized representatives of the Company and the Interconnecting Customer. Each party shall inform the other in writing of its designated and authorized representative.
3. The Company will advise the Interconnecting Customer of additional studies, as in its sole discretion deem necessary, in accordance with Good Utility Practice. The Company will not proceed with additional studies without the Interconnecting Customer's consent.
4. The Company contemplates that it will require [specify time] to complete the Distribution Facilities Detailed Study. Upon completion of the Distribution Facilities Detailed Study, the Company will provide a Distribution Facilities Detailed Study Report to the

Interconnecting Customer based on the information provided and developed as a result of this effort. If, upon review of the Distribution Facilities Detailed Study Report, the Interconnecting Customer decides to pursue its interconnection service request, the Interconnecting Customer must sign an Interconnection Service Agreement with the Company. The Distribution Facilities Impact Study and Distribution Facilities Detailed Study, together with any additional studies contemplated in Paragraph 3, shall form the basis for the Interconnecting Customer's proposed use of the Company's Distribution System and shall be furthermore utilized in obtaining necessary third-party approvals of any facilities and requested services. The Interconnecting Customer understands and acknowledges that any use of the study results by the Interconnecting Customer or its agents, whether in preliminary or final form should such approval be required, prior to NEPOOL 18.4 approval, is completely at the Interconnecting Customer's risk and that the Company will not guarantee or warrant the completeness, validity or utility of the study results prior to NEPOOL 18.4 approval.

5. The estimated costs contained within this Agreement are the Company's good faith estimate of its costs to perform the Distribution Facilities Detailed Study contemplated by this Agreement. The Company's estimates do not include any estimates for wheeling charges that may be associated with the transmission of Facility output to third parties or with rates for station service. The actual costs charged to the Interconnecting Customer by the Company may change as set forth in this Agreement. Prepayment will be required for all study, analysis, and review work performed by the Company or its Designated Agent's personnel, all of which will be billed by the Company to the Interconnecting Customer in accordance with Paragraph 6 of this Agreement.
6. The payment required is \$\_\_\_\_\_ from the Interconnecting Customer to the Company for the primary system analysis, coordination, and monitoring of the Distribution Facilities Detailed Study to be performed by the Company for the Interconnecting Customer's requested service. Such amount shall be payable in full to the Company prior to the

Company beginning the work. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increases for work to be performed if the total amount increases by 10% or more. Any such changes to the Company's costs for the study work to be performed shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) days of the Company's notice of increase, either authorize such increases and make payment in the amount set forth in such notice, or the Company will suspend the Distribution Facilities Detailed Study and this Agreement will terminate.

In the event this Agreement is terminated for any reason, the Company shall refund to the Interconnecting Customer the portion of the above credit or any subsequent payment to the Company by the Interconnecting Customer that the Company did not expend or commit in performing its obligations under this Agreement. Any additional billings under this Agreement shall be subject to an interest charge computed in accordance with the provisions of the Interconnection Requirements Document. Payments for work performed shall not be subject to refunding except in accordance with Paragraph 7 below.

7. If the actual costs for the work exceed prepaid estimated costs, the Interconnecting Customer shall make payment to the Company for such actual costs within thirty (30) days of the date of the Company's invoice for such costs. If the actual costs for the work are less than that prepaid, the Company will credit such difference toward the Company costs unbilled, or in the event there will be no additional billed expenses, the amount of the overpayment will be returned to the Interconnecting Customer with interest computed in accordance with the provisions of the Interconnection Requirements Document.
8. Nothing in this Agreement shall be interpreted to give the Interconnecting Customer immediate rights to wheel over or interconnect with the Company's Distribution System.

9. Within one (1) year following the Company's issuance of a final bill under this Agreement, the Interconnecting Customer shall have the right to audit the Company's accounts and records at the offices where such accounts and records are maintained, during normal business hours; provided that appropriate notice shall have been given prior to any audit and provided that the audit shall be limited to those portions of such accounts and records that relate to service under this Agreement. The Company reserves the right to assess a reasonable fee to compensate for the use of its personnel time in assisting any inspection or audit of its books, records or accounts by the Interconnecting Customer or its Designated Agent.
10. The Interconnecting Customer agrees to indemnify and hold the Company and its affiliated companies and directors, officers, employees, and agents of each of them (collectively "Affiliates") harmless from and against any and all damages, costs (including attorney's fees), fines, penalties and liabilities, in tort, contract, or otherwise (collectively "Liabilities") resulting from claims of third parties arising, or claimed to have arisen as a result of any acts or omissions of the Company or its Affiliates under this Agreement. The Interconnecting Customer hereby waives recourse against the Company and its Affiliates for, and releases the Company and its Affiliates from, any and all Liabilities for or arising from damage to its property due to a performance under this Agreement by the Company or its Affiliates.
11. If either party materially breaches any of its covenants hereunder, the other party may terminate this Agreement by serving notice of same on the other party to this Agreement.
12. This agreement shall be construed and governed in accordance with the laws of the Commonwealth of Massachusetts and with 220 C.M.R. ' 8.00 et seq.
13. All amendments to this Agreement shall be in written form executed by both parties.



14. The terms and conditions of this Agreement shall be binding on the successors and assigns of either party.
15. This Agreement will remain in effect for a period of up to two years from its effective date and is subject to extension by mutual agreement. Either party may terminate this Agreement by thirty (30) days' notice except as is otherwise provided herein.

Interconnecting Customer:

The Company:

Name: \_\_\_\_\_

Name:

Title: \_\_\_\_\_

Title:

Date: \_\_\_\_\_

Date:

## **EXHIBIT 6**

### **Insurance Requirements**

The Interconnecting Customer, at its own cost and expense, shall procure and maintain insurance in the forms and amounts acceptable to the Company at the following minimum levels of coverage:

- a) For Category 2 Facilities installed at a residential location:
  - Comprehensive General Liability Coverage including Operations, Contractual Liability and Broad Form Property Damage Liability written with limits no less than \$1,000,000.00 combined single limit for Bodily Injury Liability and Property Damage Liability.
  
- b) For Category 2 Facilities installed at a non-residential location and for all Category 3, 4 and 5 Facilities:
  - Statutory coverage for workers' compensation, and Employer's Liability Coverage with a limit no less than \$500,000.00 per accident;
  
  - Comprehensive General Liability Coverage including Operations, Contractual Liability and Broad Form Property Damage Liability written with limits no less than \$5,000,000.00 combined single limit for Bodily Injury Liability and Property Damage Liability; and
  
  - Automobile Liability for Bodily Injury and Property Damage to cover all vehicles used in connection with the work with limits no less than

\$1,000,000.00 combined single limit for Bodily Injury and Property Damage  
Injury.

Prior to commencing the work on a Category 2 Facility at a residential location, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above.

Prior to commencing the work on a Category 2 Facility at a non-residential location or on a category 3, 4 or 5 Facility, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above and the Interconnecting Customer shall notify and send copies to the Company of any policies maintained hereunder written on a "claims-made" basis. The Company may at its discretion require the Interconnecting Customer to maintain tail coverage for five years on all policies written on a "claims-made" basis.

Every contract of insurance providing the coverages required in this provision shall contain the following or equivalent clause: "No reduction, cancellation or expiration of the policy shall be effective until thirty (30) days from the date written notice thereof is actually received by the Interconnecting Customer.@ Upon receipt of any notice of reduction, cancellation or expiration, the Interconnecting Customer shall immediately notify the Company.

The Company and its Affiliates shall be named as additional insureds, as their interests may appear, on the Comprehensive General Liability and Automobile Liability policies described above.

The Interconnecting Customer shall waive all rights of recovery against the Company for any loss or damage covered by said policies. Evidence of this requirement shall be noted on all certificates of insurance provided to the Company.

## **INTERCONNECTION REQUIREMENTS DOCUMENT CUSTOMER-OWNED GENERATING FACILITIES**

### **1.0 Preamble**

This document (“Interconnection Requirements Document”) describes the process and requirements for a customer to connect a Facility, as defined herein, to the Company’s Distribution System.

The process and requirements contained herein are applicable to all Facilities interconnecting with the Company’s Distribution System including Qualifying Facilities, as defined in 220 CMR 8.02, and On-Site Generating Facilities, as defined in 220 CMR 8.02.

The process and requirements contained herein are not applicable to portable emergency generators. Such generators must be installed in accordance with Article 700 of the National Electrical Code and Article 310 of the National Grid USA publication Information and Requirements for Electric Service Handbook in such a manner as to ensure that the generator cannot be operated in parallel with the Company’s Distribution System. Attempting to interconnect a generator of this type with the Company’s Distribution System, except as specified above, can cause significant damage to the Company’s Distribution System and catastrophic damage to the Interconnecting Customer’s generator and premises.

The Company will work closely and promptly with any customer who desires to install a Facility.

### **2.0 Definitions**

The following words and terms shall be understood to have the following meanings when used in this Interconnection Requirements Document:

**Affiliate:** Any company that is a subsidiary of National Grid USA.

**Company:** Massachusetts Electric Company or Nantucket Electric Company, as applicable.

**Designated Agent:** Any entity that performs actions or functions on behalf of the Company or the Interconnecting Customer required under this Interconnection Requirements Document and/or the Exhibits hereto.

**Distribution Facilities Upgrades:** Modifications or additions to distribution-related facilities that are integrated with and support the Company's Distribution System for the benefit of the Interconnecting Customer.

**Distribution Facilities Impact Study:** The first phase of engineering study conducted by the Company to determine the required modifications to its Distribution System, resulting in study grade cost estimates (+/- 25%) and an approximate estimate of the time required for such modifications that will be required to provide the requested interconnection service. The Distribution Facilities Impact Study is not suitable for finalizing agreements, contracts or commitments.

**Distribution Facilities Detailed Study:** The final phase of engineering study conducted by the Company to determine the required detailed modifications to its Distribution System, resulting in project grade cost estimates (+/- 10%) and an estimate of the time required for such modifications that will be required to provide the requested interconnection service.

**Distribution Facilities Upgrades Charge:** A charge to be paid by an Interconnecting Customer equal to all costs associated with the upgrade or modification of the Distribution System for safe interconnection of the Facility with the Company's Distribution System.

**Distribution System:** The facilities owned, controlled or operated by the Company that are used to provide distribution service to its customers.

**Facility:** A customer-owned source of electricity, which may be an Inverter or a rotating generator of the synchronous or induction type and all facilities ancillary and appurtenant thereto, which the Interconnecting Customer requests to interconnect to the Distribution System.

**Good Utility Practice:** Any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region.

**In-Service Date:** The date on which the Facility and Distribution Facilities Upgrades (if applicable) are complete and ready for service, even if the Facility is not placed in service on or by that date.

**Interconnecting Customer:** A customer desiring to install an independently-operated Generating Facility, which is interconnected with the Company's Distribution System.

**Interconnection Service Agreement:** An agreement for interconnection service, the form of which is provided in Exhibit 2, between the Interconnecting Customer and the Company. The agreement also includes any amendments or supplements thereto entered into by the Interconnecting Customer and the Company.

**Inverter:** An electrical device that accepts direct current as input, and produces alternating current as output.

**ISO-New England:** The Independent System Operator established in accordance with the New England Power Pool ("NEPOOL") Agreement, which is responsible for managing the bulk power generation and transmission systems in New England.

**Metering Point:** For meters that do not utilize instrumentation transformers, the point at which the billing meter is connected. For meters that utilize instrumentation transformers, the point at which the instrumentation transformers are connected.

**Network Distribution System:** Electrical service where two or more distribution transformers have their secondary windings connected in parallel to form a network of conductors supplying service voltage to customers. Primary voltage to the transformers

may come from a number of independent circuits, so that loss of one primary circuit will not generally cause a loss of service voltage to customers.

**Notice of Intent to Interconnect:** Notice provided by Interconnecting Customer to the Company, the form of which is shown in Exhibit 1, which initiates the interconnection process.

**On-Site Generating Facility:** A class of customer-owned generating facilities with peak capacity of 60 kW or less, as defined in 220 CMR 8.02.

**Parties:** The Company and the Interconnecting Customer.

**Policy and Practices for Protection Requirements for New or Modified**

**Interconnections:** The Company's policy concerning protection requirements for new or modified interconnections to power sources, which is included in Exhibit 3 to this Interconnection Requirements Document and attached and incorporated by reference.

**Point of Delivery:** A point on the Company's Distribution System where the Interconnecting Customer makes capacity and energy available to the Company. The point of Delivery shall be specified in the Interconnection Service Agreement.

**Point of Receipt:** A point on the Company's Distribution System where the Company delivers capacity and energy to the Interconnecting Customer. The Point of Receipt shall be specified in the Interconnection Service Agreement.

**Qualifying Facility:** A generation facility that has received certification as a Qualifying Facility from the Federal Energy Regulatory Commission in accordance with the Federal Power Act, as amended by the 1978 Public Utilities Regulatory Policies Act, as defined in 220 CMR 8.02.

**Radial Distribution System:** Electrical service from a system consisting of one or more primary circuits extending from a single substation or transmission supply point arranged such that each primary circuit serves customers in a particular local area.

### **3.0 Process Overview**

The process of interconnecting a Facility with the Company's system is as follows:

- a. The Interconnecting Customer submits a Notice of Intent to Interconnect ("Notice of Intent") to the Company. The information that is required to be provided in the Notice of Intent is provided in Exhibit 1. Such notice shall be sent to:

Massachusetts Electric Company  
55 Bearfoot Road  
Northboro, MA 01532  
Attn: Senior Vice President – Business Services

- b. Upon receipt of the Notice of Intent, the Company will assign an Account Manager to work with the Interconnecting Customer and serve as the point of contact for all future activities. The Notice of Intent will be reviewed for completeness and to verify that the request is for an interconnection to the Company's Distribution System. In addition, if the Notice of Intent is for an Inverter-based Facility, the Company will determine if the Facility complies with UL Standard 1741. If any of these requirements are not met, the Interconnecting Customer will be provided written notice and the application process will be suspended until the Interconnecting Customer has remedied any deficiencies.
- c. Upon verification and within 45 days of the Company's receipt of the Notice of Intent, the Company will conduct an initial site inspection of the proposed Facility to determine if a Distribution Facilities Impact Study is required. If a Distribution Facilities Impact Study is not required and the Facility meets the requirements for immediate interconnection to the Company's system, the Interconnecting Customer and the Company shall execute an Interconnection Service Agreement, the form of



which is provided in Exhibit 2, and the Interconnecting Customer shall pay the Company the amount specified in such agreement. In some cases, the Company may determine that a Distribution Facilities Impact Study is not required and may proceed directly with a Distribution Facilities Detailed Study.

- d. If a Distribution Facilities Impact Study is required, the Company will prepare a cost estimate to perform a Distribution Facilities Impact Study and will submit such estimate to the Interconnecting Customer.
- e. If the Interconnecting Customer elects to proceed with the Distribution Facilities Impact Study, the Interconnecting Customer and the Company shall execute a Distribution Facilities Impact Study Agreement, the form of which is provided in Exhibit 4, and the Interconnecting Customer shall pay the Company the amount specified in such agreement.
- f. Upon execution of the Distribution Facilities Impact Study Agreement and receipt of payment in full, the Company will conduct the Distribution Facilities Impact Study and upon completion of the work issue a Distribution Facilities Impact Study Report to the Interconnecting Customer.
- g. If a Distribution Facilities Detailed Study is required and the Interconnecting Customer elects to proceed with such study, the Company will prepare a cost estimate to perform a Distribution Facilities Detailed Study and will submit such estimate to the Interconnecting Customer.
- h. If the Interconnecting Customer elects to proceed with the Distribution Facilities Detailed Study, the Interconnecting Customer and the Company shall execute a Distribution Facilities Detailed Study Agreement, the form of which is provided in

Exhibit 5, and the Interconnecting Customer shall pay the Company the amount specified in such agreement.

- i. Upon execution of the Distribution Facilities Detailed Study Agreement and receipt of payment in full, the Company will conduct the Distribution Facilities Detailed Study and upon completion of the work issue a Distribution Facilities Detailed Study Report to the Interconnecting Customer.
- j. If, upon receipt of the Distribution Facilities Detailed Study Report, the Interconnecting Customer elects to proceed with the construction of facilities to interconnect the Facility the Interconnecting Customer and the Company shall execute an Interconnection Service Agreement and the Interconnecting Customer shall pay the Company the amount specified in such Agreement. If the Interconnecting Customer does not agree with the Company's cost estimate, the Interconnecting Customer may petition the Massachusetts Department of Telecommunications and Energy to review the reasonableness of the Company's cost estimate.
- k. Upon execution of the Interconnection Service Agreement and receipt of payment in full, the Company will construct the required facilities.

#### **4.0 Basic Understandings**

The Interconnecting Customer intends to install a Facility on the Interconnecting Customer's premises. This power source will be connected electrically to the Company's Distribution System and operate in synchronism with the voltage and frequency maintained by the Company during normal operating conditions. The interconnection of the power source with the Company's Distribution System must meet the technical requirements of this Interconnection Requirements Document and may require an upgrade or other modifications to the Distribution System in order to meet such requirements. Subject to the requirements contained in this

Interconnection Requirements Document, the Company or its Affiliate shall, at Interconnecting Customer's expense, modify the Distribution System accordingly.

#### 4.1 Facility Classification

The interconnection requirements for a Facility or Inverter are dependent on its capacity and the type of power production technology utilized.

To determine the requirements for a given Facility, the following Categories and Types have been established:

Category	Maximum Output (kW)
1	$\leq 10$
2	$> 10$ and $\leq 60$
3	$> 60$ and $\leq 300$
4	$> 300$ and $\leq 1,000$
5	$> 1,000$

Type	Technology
A-1	Inverter-based, single phase
A-3	Inverter-based, three phase
B-1	Induction generator, single phase
B-3	Induction generator, three phase
C-1	Synchronous generator, single phase
C-3	Synchronous generator, three phase

Tables 1-A and 1-B provide an overview of the applicable interconnection requirements for Category 1, 2, 3 and 4 Facilities. Category 5 Facilities are subject to the full extent of requirements contained in this Interconnection Requirements Document

**TABLE 1A**  
**OVERVIEW OF INTERCONNECTION REQUIREMENTS**

Category 1 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-1	Requirement 1	Requirements 1 & 2	Allowed	Not Required
Type A-3	Requirement 1	Requirements 1 & 2	Allowed	Not Required
Type B-1	Requirement 3	Requirements 2 & 3	Allowed	Required **
Type B-3	Requirement 3	Requirements 2 & 3	Allowed	Required **
Type C-1	Requirement 4	Requirements 2 & 4	Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Allowed	Required

Category 2 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System	Net Metering	Distribution Facilities Impact Study
Type A-1	Requirement 1	Requirements 1 & 2	Allowed	Required (Note A)
Type A-3	Requirement 1	Requirements 1 & 2	Allowed	Required (Notes A & B)
Type B-1	Requirement 3	Requirements 2 & 3	Allowed	Required (Note A)
Type B-3	Requirement 3	Requirements 2 & 3	Allowed	Required (Notes A & B)
Type C-1	Requirement 4	Requirements 2 & 4	Allowed	Required (See Note A)
Type C-3	Requirement 4	Requirements 2 & 4	Allowed	Required (Notes A & B)

\* Most distribution systems are radial in nature; however, network systems are employed in some urban areas. Contact the Company to determine whether the proposed Facility site is served by a Radial Distribution System or Network Distribution System.

\*\* The scope of the study is expected to be minimal.

Requirement. 1: The Inverter must comply with UL Standard 1741.  
A photovoltaic system must also comply with IEEE Standard 929-2000.

Requirement. 2: For installations in which the Facility minimum load is less than fifteen (15) times the peak output of the generating system, a reverse power flow relay will be required as part of the protection system. If the Facility minimum load is at least fifteen (15) times the peak output of the generating system, a reverse power flow relay will not be required.

Requirement. 3: The Facility must meet the protection requirements specified for induction generators as shown in Exhibit 3.

Requirement. 4: The Facility must meet the protection requirements specified for synchronous generators as shown in Exhibit 3.

Note A: If the Interconnecting Customer proposes to install a Facility with a capacity greater than 100% of the capacity of the distribution transformer providing site service, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

Note B: If the Interconnecting Customer receives single-phase electrical service from the Company but desires to install a three-phase power Facility, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

**TABLE 1B**  
**OVERVIEW OF INTERCONNECTION REQUIREMENTS**

Category 3 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-3	Requirement 1	Requirements 1 & 2	Not Allowed	Required (Note A)
Type B-3	Requirement 3	Requirements 2 & 3	Not Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Not Allowed	Required

Category 4 Facilities				
	If Connected to Radial Distribution System*	If Connected to Network Distribution System*	Net Metering	Distribution Facilities Impact Study
Type A-3	Requirement 1	Requirements 1 & 2	Not Allowed	Required
Type B-3	Requirement 3	Requirements 2 & 3	Not Allowed	Required
Type C-3	Requirement 4	Requirements 2 & 4	Not Allowed	Required

\* Most distribution systems are radial in nature; however, network systems are employed in some urban areas. Contact the Company to determine whether the proposed Facility site is served by a Radial Distribution System or Network Distribution System.

Requirement. 1: The Inverter must comply with UL Standard 1741.

Requirement. 2: For installations in which the Facility minimum load is less than fifteen (15) times the peak output of the generating system, a reverse power flow relay will be required as part of the protection system. If the Facility minimum load is at least fifteen (15) times the peak output of the generating system, a reverse power flow relay will not be required.

Requirement 3: The Facility must meet the protection requirements specified for induction generators as shown in Exhibit 3.

Requirement 4: The Facility must meet the protection requirements specified for synchronous generators as shown in Exhibit 3.

Note A: If the Interconnecting Customer proposes to install a Facility with a capacity greater than 100% of the capacity of the distribution transformer providing service to the site, a Distribution Facilities Impact Study and Distribution Facilities Detailed Study would be required and an upgrade charge would apply.

## **5.0 Construction of the Distribution Facilities Upgrades**

**5.1 General Considerations:** The Company or its Affiliate or another party selected pursuant to this section shall construct the Distribution Facilities Upgrades at the Interconnecting Customer's expense. The Company shall determine a schedule for construction and final interconnection consistent with 220 CMR 8.04(6)(a). The Company shall fulfill its obligations under this schedule in order to permit interconnection with the Facility consistent with 220 CMR 8.04(6)(a). The Company shall use, or specify that the selected contractor use, standard equipment customarily employed by the Company or its Affiliate for its own system in accordance with Good Utility Practice in making the final interconnection.

Pursuant to 220 CMR 8.04(3), the Interconnecting Customer also agrees to pay the Company for all reasonable costs and fees required to enable the Company to fulfill its obligations, including any tax liability, the costs and fees of all permits, licenses, franchises or regulatory or other approvals necessary for the construction and operation of the Distribution Facilities Upgrades and any facilities ancillary or appurtenant to them. The Company shall consult with the Interconnecting Customer on decisions involving substantial additional costs to be incurred by the Company in fulfillment of its obligations.

**5.2 QF Certification and Engineer's Report:** If the Interconnecting Customer is a Qualifying Facility, it shall provide the Company with proof that its facility has received certification as a Qualifying Facility from the Federal Energy Regulatory Commission in accordance with the Federal Power Act, as amended by the Public Utilities Regulatory Policies Act of 1978. Such proof shall be provided to the Company within the thirty (30) day period prior to the in-service date of the Facility. The Interconnecting Customer shall also provide the Company with notice of any change in its Qualifying Facility status within fifteen (15) days of any such change.

Further, within the thirty (30) day period prior to the In-Service Date, the Interconnecting Customer, at its expense, shall submit an independent engineer's report to the Company stating

that it is reasonably projected that during the ten-year period, beginning with the year in which the Facility is placed in service, and, at the Interconnecting Customer's option, not including data from the first year of this ten-year period, no more than 5% of the total power flows (the 5% test as defined by IRS Notice 88-129) over the interconnection to the Interconnecting Customer. Acceptance of this report shall be subject to the Company's review and concurrence. The Company may require that a second report be provided, at the Interconnecting Customer's expense, if the Company reasonably concludes that the first report is unreliable for purposes of anticipating the taxability of the services provided hereunder. In order to meet the requirements of IRS Notice 88-129 by March 1 of the year following the start of Interconnection Service, and annually thereafter, the Interconnecting Customer shall provide to the Company a report of the total bi-directional power flows over the interconnection during the previous calendar year.

The Interconnecting Customer agrees that payments to the Company hereunder will be deemed a contribution in aid of construction ("CIAC") and taxable to the Company if the Facility does not receive Qualifying Facility certification or the engineer's report concludes that the 5% test will not be met. In either event, the Interconnecting Customer agrees to pay the Company in advance for all taxes owed on the CIAC. Such payment shall be made within ten (10) days of notice from the Company of the estimated taxes owed, based on the Company's then effective gross-up factor times the amount of the CIAC. The Company may refuse final interconnection with the Facility until such payment is made.

**5.3 Land Interests:** The Interconnecting Customer recognizes that Distribution Facilities Upgrades may require acquisition of land interests, which may require individual agreements between the Company or its Affiliate and the landowners. The Interconnecting Customer agrees to pay to the Company all reasonable costs incurred by it or its Affiliate associated with these acquisition agreements in advance of their execution. The Company reserves the right to draft any and all documents creating land interests that it will receive to effectuate interconnection service under this Interconnection Requirements Document.

In the event the Interconnecting Customer acquires the land, permits, licenses, franchises or regulatory or other approvals necessary for the construction and operation of the Distribution Facilities Upgrades, the Company has the right, at Interconnecting Customer's expense, to approve or reject any terms and conditions related thereto prior to the start of service.

## **6.0 Distribution Facilities Upgrades Charge**

If Distribution Facilities Upgrades are required to accommodate installation of the Facility, the Interconnecting Customer shall be required to pay a Distribution Facilities Upgrades Charge. Such charge may be billed as an incremental monthly charge based upon the total costs of the facilities upgrade, with the total upgrade cost amortized over three years. The Interconnecting Customer also has the option of paying the total Distribution Facilities Upgrades Charge prior to interconnection. In the event that other customers of the Company are served by the upgraded facilities at the time the upgrade is implemented, the Interconnecting Customer shall pay its allocated share of the Distribution Facilities Upgrades Charge.

## **7.0 Delivery and Measurement of Electricity**

**7.1 Voltage Level:** All electricity across the Interconnection Point shall be in the form of single-phase or three-phase sixty-hertz alternating current at a voltage class determined by mutual agreement of the Parties.



## **7.2 Machine Reactive Capability**

**7.2.1 Category 1, 2, 3 and 4 Facilities:** Category 1, 2, 3 or 4 Facilities will not be required to provide reactive capability.

**7.2.2 Category 5 Facilities:** Each Category 5 Facility interconnected with the Company's Distribution System shall be required to provide reactive capability to regulate and maintain system voltage at the Interconnection Point. The Company and NEPOOL shall establish a scheduled range of voltages to be maintained by the Facility. The reactive capability requirements shall be reviewed as part of the Distribution Facility Impact Study and Distribution Facility Detailed Study.

**7.3 Metering, Related Equipment and Billing Options:** The Company shall furnish, read and maintain all revenue metering equipment. Except as provided below, the Company shall own the meter and the Interconnecting Customer shall pay to the Company a monthly charge to cover taxes, meter maintenance, incremental reading and billing costs, the allowable return on the invoice cost of the meter and the depreciation of the meter. These charges are set forth in Schedule B of the Company's Qualifying Facility Power Purchase Rate P, M. D. T. E. No. 1032-C, as amended from time to time. If the Facility is a Qualifying Facility or On-Site Generating Facility the Interconnecting Customer may elect to own the meter, in which case, the Interconnecting Customer shall pay to the Company a monthly charge to cover meter maintenance and incremental reading and billing costs. These charges are set forth in Schedule B of the Company's Qualifying Facility Power Purchase Rate P, as amended from time to time.

The Interconnecting Customer shall provide suitable space within the Facility for installation of the metering, telemetering and communication equipment at no cost to the Company.

The Interconnecting Customer shall be responsible for purchasing and installing software, hardware and/or other technology that may be required by the Company to read billing meters.

All metering equipment installed pursuant to this Interconnection Requirements Document and associated with the Facility shall be routinely tested by the Company at Interconnecting Customer's expense, in accordance with applicable Company and/or ISO-New England criteria, rules and standards. If, at any time, any metering equipment is found to be inaccurate by a margin greater than that allowed under applicable criteria, rules and standards, the Company shall cause such metering equipment to be made accurate or replaced. The cost to repair or replace the meter shall be borne by the Company, if the Company owns the meter, or by the Interconnecting Customer if the Interconnecting Customer owns the meter. Meter readings for the period of inaccuracy shall be adjusted so far as the same can be reasonably ascertained; provided, however, no adjustment prior to the beginning of the preceding month shall be made except by agreement of the Parties. Each party shall comply with any reasonable request of the other concerning the sealing of meters, the presence of a representative of the other party when the seals are broken and the tests are made, and other matters affecting the accuracy of the measurement of electricity delivered from the Facility. If either party believes that there has been a meter failure or stoppage, it shall immediately notify the other.

If the Metering Point and the Point of Receipt or Point of Delivery are not at the same location, the metering equipment shall record delivery of electricity in a manner that accounts for losses occurring between the Metering Point and the Point of Receipt or Point of Delivery. Losses between the Metering Point and Point of Receipt will be reflected pursuant to applicable Company, NEPOOL or ISO-New England criteria, rules or standards.

The type of metering equipment to be installed at a Facility is dependent on the Category (size) of the facility and how and to whom the net Facility output will be sold. The available equipment options and associated requirements are:

- Net Metering – in which a standard distribution class meter is installed and is enabled to run in a normal direction during periods of net consumption and to run backwards during periods of net generator output. All metering equipment included in this type of installation, including self-contained meters and instrument transformers and meters, shall meet ANSI C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers.
- Bi-directional, non-interval meter without remote access – in which a distribution class meter with multiple registers is installed. One set of registers will record energy flows from the Company to the Facility during periods when the Facility is a net consumer of energy (the other register will record no flow during these periods) and a second set of registers will flow energy flows from the Facility to the Company during periods when the Facility is a net producer of energy (the other register will record no flow during these periods). Each set of registers will record total flows only and will not record flows during specific intervals. All metering equipment included in this type of installation, including self-contained meters and instrument transformers and meters, shall meet ANSI C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers.
- Bi-directional, interval meter with remote access – in which a distribution class meter with multiple registers is installed. One set of registers will record energy flows from the Company to the Facility during periods when the Facility is a net consumer of energy (the other register will record no flow during these periods) and a second set of registers will flow energy flows from the Facility to the Company during periods when the Facility is a net producer of energy (the other register will record no flow during these periods). Each set of registers will record total flows as well as flows during hourly intervals. In addition, the meters will be equipped with remote access capability that may include telemetering to the extent

required by applicable NEPOOL standards. All metering equipment included in this type of installation shall meet the requirements contained in NEPOOL Operating Procedure No. 18, "Metering and Telemetering Criteria" and the Company's "Policy and Practices for Metering and Telemetering Requirements for New or Modified Interconnections". Copies of both publications are available from the Company upon request. The Interconnecting Customer shall be responsible for providing all necessary leased telephone lines and any necessary protection for leased lines and shall furthermore be responsible for all communication required by ISO-New England, or by ISO-New England's designated satellite. The Interconnecting Customer shall maintain all telemetering and transducer equipment at the Facility in accordance with ISO-New England criteria, rules and standards. The Company will purchase, own and maintain all telemetering equipment located on the Interconnecting Customer's facilities, if the Interconnecting Customer desires, at the Interconnecting Customer's expense. The Interconnecting Customer shall provide, install and own Company-approved or Company-specified test switches in the transducer circuits.

**7.3.1 Category 1 and 2 Facilities:** Unless the Interconnecting Customer elects another form of metering, Category 1 and 2 Facilities will be equipped with Net Metering.

**7.3.2 Category 3 and 4 Facilities:** Category 3 and 4 Facilities shall not be entitled to utilize Net Metering. Category 3 and 4 Facilities will be equipped with a bi-directional, non-interval meter without remote access; provided, however a bi-directional, interval meter with remote access shall be installed if the Interconnecting Customers elects to install such meter at its expense or the sale of energy from the Facility requires such a meter (such as in the case of a sale from the Facility to the NEPOOL markets or to a third party).

**7.3.3 Category 5 Facilities:** Category 5 Facilities shall only be equipped with bi-directional, interval meters with remote access. In addition, Category 5 Facilities which are 5 MW or greater are required by NEPOOL Operating Procedure No. 18 to provide telemetering equipment and to supply accurate and reliable information to system operators regarding metered values for MW, MVAR, volt, amp, frequency, breaker status and all other information deemed necessary by ISO-NE and the NEPOOL Satellite (REMVEC).

**8.0 Notice Provisions:** If at any time, in the reasonable exercise of the Company's judgment, operation of the Facility adversely affects the quality of service to the Company's customers or interferes with the safe and reliable operation of the Distribution System, the Company may discontinue interconnection service to the Interconnecting Customer until the condition has been corrected. Unless an emergency exists or the risk of one is imminent, the Company shall give Interconnecting Customer reasonable notice of its intention to discontinue service and, where practical, allow suitable time for Interconnecting Customer to remedy the offending condition. The Company's judgment with regard to discontinuance of deliveries or disconnection of facilities under this paragraph shall be made in accordance with Good Utility Practice. In the case of such discontinuance, the Company shall immediately confer with Interconnecting Customer regarding the conditions causing such discontinuance and its recommendation concerning the timely correction thereof.

**9.0 Access and Control:** Properly accredited representatives of the Company or its Affiliate shall at all reasonable times have access to the Facility to make reasonable inspections and obtain information required in connection with this Interconnection Requirements Document. At the Facility, such representatives shall make themselves known to the Interconnecting Customer's personnel, state the object of their visit, and conduct themselves in a manner that will not interfere with the construction or operation of the Facility. The Company or its Designated Agent will have control such that it may open or close the circuit breaker or

disconnect and place safety grounds at the Point of Receipt, Point of Delivery, or at the station if the Point of Delivery is remote from the station.

## **10.0 Force Majeure and Indemnification**

**10.1 Force Majeure:** An event of Force Majeure means any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, any curtailment, order, regulation or restriction imposed by governmental, military or lawfully established civilian authorities, or any other cause beyond either party's control. A Force Majeure event does not include an act of negligence or intentional wrongdoing. Neither the Company nor the Interconnecting Customer will be considered in default as to any obligation under this Interconnection Requirements Document if prevented from fulfilling the obligation due to an event of Force Majeure. However, a party whose performance is hindered by an event of Force Majeure shall make all reasonable efforts to perform its obligations under this Interconnection Requirements Document.

**10.2 Indemnification:** The Interconnecting Customer shall at all times indemnify, defend, and save the Company harmless from any and all damages, losses, claims, including claims and actions relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the Company's performance of its obligations under this Interconnection Requirements Document on behalf of the Interconnecting Customer, except in cases of gross negligence or intentional wrongdoing by the Company.

**10.3 Insurance:** For Category 2 Facilities, except Category 2 Facilities that are Net Metered, and all Category 3, 4 and 5 Facilities, the Interconnecting Customer shall be required to provide and maintain insurance coverage as described in Exhibit 6, attached hereto and incorporated by reference.

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E No. 1000  
Interconnection Requirements Document  
Sheet 20

Effective: March 1, 2002

**EXHIBIT 1**

**NOTICE OF INTENT TO INTERCONNECT**

The following information must be provided with the Interconnecting Customer's Notice of Intent to Interconnect:

- a) The name and address of the Interconnecting Customer and location of the generating facility;
- b) A brief description of the generating facility, including a statement indicating whether the generating facility is a small power production facility or cogeneration facility;
- c) The primary energy source used or to be used by the generating facility;
- d) The power production capacity of the generating facility and the maximum net capacity that may be delivered to the Company's system;
- e) The owners of the generating facility, including the percentage ownership by any electric utility or public utility holding company, or by any entity owned by either;
- f) The expected date of installation and the anticipated on-line date;
- g) The anticipated purchaser of the output of excess output of the generating facility (the Company or other third party) and the anticipated form (simultaneous purchase and sale, net purchase and sale, net metering, or other method);
- h) A description of any power conditioning equipment to be located between the generating facility and the Company's system;
- i) A description of the type of generator used in the generating facility installation (synchronous, induction, photovoltaic, or other).

To the extent practical, the above information may be submitted using the accompanying form.



### NOTICE OF INTENT TO INTERCONNECT

APPLICANT		TELEPHONE #		DATE	
STREET (MAILING) ADDRESS			CITY, STATE & ZIP CODE		
FACILITY LOCATION (IF NOT ADDRESS ABOVE)			CITY, STATE & ZIP CODE		
UTILITY PROVIDING SERVICE			ACCOUNT NUMBER		
ENERGY SOURCE	PEAK POWER RATING-KW	INVERTER TYPE <sup>1</sup> (if applicable)		GENERATOR TYPE <sup>2</sup> (if applicable)	
<p>1. Only inverters meeting IEEE Standard 929-2000 and UL Standard 1741 are qualified for interconnection. The Company will determine from this application if your inverter is qualified and contact you.</p> <p>2. Any rotating generator requires protective equipment at the point of interconnection. If you have this type of generator, the Company will contact you regarding required equipment based upon this application.</p>					
If an ownership connection exists between the applicant and this utility or National Grid USA, please provide details below and on the back of this form.					
ESTIMATED INSTALLATION DATE			ESTIMATED OPERATION DATE		
<p>If the generating facility is rated at 60 KW or less you are eligible for monthly net energy billing.</p> <p>If eligible, do you request single-meter net energy billing/sales? YES ___ NO ___</p>					

I hereby certify that, to the best of my knowledge, all of the information provided in this Notice is true.

Signature of Applicant \_\_\_\_\_

### EXHIBIT 2 Interconnection Service Agreement

- 1.0 This Interconnection Service Agreement, dated as of \_\_\_\_\_ is entered into, by and between either Massachusetts Electric Company or the Nantucket Electric Company, as appropriate, (hereinafter referred to as the “Company”), and \_\_\_\_\_ (“Interconnecting Customer”).
- 2.0 The Interconnecting Customer has been determined by the Company to have tendered a Notice of Intent to Interconnect, pursuant to 220 C.M.R. ' 8.04 to interconnect the Facility described in Attachment 1.
- 3.0 The Company agrees to provide and the Interconnecting Customer agrees to take and pay for Interconnection Service in accordance with the provisions of the Company’s Interconnection Requirements Document, as may be amended from time to time, this Interconnection Service Agreement, and any Attachments to this Interconnection Service Agreement.
- 4.0 The Interconnecting Customer agrees at all times to operate and maintain the Facility in accordance with the requirements of the Company’s Interconnection Requirements Document.
- 5.0 The Company agrees to construct the Distribution Facilities Upgrades identified in Attachment 2 that are required to accommodate the interconnection of the Facility to the Company’s Distribution System. The Interconnecting Customer agrees to pay to the Company the amounts shown in Attachment 3 for the construction of the Distribution Facilities Upgrades.
- 6.0 The Interconnecting Customer has elected to (initial one) ( ) own ( ) have the Company own the associated meter and agrees, in addition to the amounts specified in paragraph 5 above, to pay to the Company each month the applicable metering charge as set forth in the Company’s P-Rate, as approved by the Massachusetts Department of Telecommunications and Energy from time to time.
- 7.0 Any notice or request made to or by either party regarding this Interconnection Service Agreement shall be made to the representative of the other party as indicated below:

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
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Nantucket Electric Company  
Massachusetts Electric Company  
55 Bearfoot Road  
Northborough, MA 01532  
Attn: Senior Vice President – Business Services

Interconnecting Customer:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8.0 The Terms and Conditions for Distribution Service, where not in conflict with the terms hereof, are incorporated herein and made a part hereof.

IN WITNESS WHEREOF, the parties have caused this Interconnection Service Agreement to be executed by their respective authorized officials.

Nantucket Electric Company \_\_\_\_: or Massachusetts Electric Company \_\_\_\_:

By: \_\_\_\_\_  
Name Title Date

Interconnecting Customer:

By: \_\_\_\_\_  
Name Title Date

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
Exhibit 2  
Sheet 25

Attachment 1

Description of Facilities

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
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Attachment 2

Distribution Facilities Upgrades

Massachusetts Electric Company  
Nantucket Electric Company

M. D. T. E. No. 1000-A  
Canceling M. D. T. E. No. 1000  
Interconnection Requirements Document  
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Attachment 3

Costs for the Construction of the Distribution Facilities Upgrades

### EXHIBIT 3

#### **Policy and Practices for Protection Requirements For New or Modified Generation Interconnections with the Distribution System**

Any Facility desiring to interconnect with the Company's Distribution System or modify an existing interconnection must meet the technical specifications and requirements set forth in this Protection Policy. Once interconnected, the Company, in keeping with Good Utility Practice and in its sole discretion, may disconnect from the Facility if the Facility deviates from the technical specifications and requirements contained in this Protection Policy. The Facility must return to full compliance with this Protection Policy prior to reconnecting with the Company's system.

The specifications and requirements listed herein are intended solely to mitigate possible adverse impacts caused by the Facility on the Company's equipment and on other customers of the Company. They are not intended to address protection of the Facility itself or its internal load. It is the responsibility of the Facility to comply with the requirements of all appropriate standards, codes, statutes and authorities to protect itself and its loads.

To determine the protection requirements for a given Facility, the following Categories have been established:

Category	Maximum Output (kW)
1	$\leq 10$
2	$> 10$ and $\leq 60$
3	$> 60$ and $\leq 300$
4	$> 300$ and $\leq 1,000$
5	$> 1,000$

## **I Protection Requirements**

### **Category 1 Facilities**

#### **General Requirements:**

If, due to the interconnection of the Facility, when combined with preexisting facilities interconnected to the Company's system, the rating of any of the Company's equipment or the equipment of others connected to the Company's system will be exceeded or its control function will be adversely affected, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of equipment to eliminate the condition. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

#### **Requirements for Inverter-based (Type A) installations:**

- a. The Company's distribution circuits generally operate with automatic reclosing following a trip with automatic reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Facility is responsible for protecting its equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation.
- b. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Company's approving the Interconnecting Customer's request for interconnection:
  - An electrical one-line diagram or sketch depicting how the inverter will be interconnected relative to the service entrance panel and the electric meter.



- The make, model and manufacturer's specification sheet for the inverter.
- c. For Facilities that utilize photovoltaic technology, it is required that the system be installed in compliance with IEEE Standard 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems". The inverter shall meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems". Based on the information supplied by the Interconnecting Customer, if the Company determines the inverter is in compliance with UL 1741, the Interconnecting Customer's request for interconnection will be approved without the need to conduct a Distribution Facilities Impact Study or a Distribution Facilities Detailed Study.
- d. For Facilities that utilize wind technology or other direct current energy sources and employ inverters for production of alternating current, the inverter shall meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems". Based on the information supplied by the Interconnecting Customer, if the Company determines the inverter is in compliance with UL 1741 the Interconnecting Customer's request for interconnection will be approved without the need to conduct a Distribution Facilities Impact Study or a Distribution Facilities Detailed Study.

**Requirements for Induction Generator (Type B) installations:**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
  - Three copies of a Facility one-line drawing.
  - Three copies of a one-line drawing showing the relays, if required herein, and metering including current transformer ("CT") and voltage transformer ("VT")

connections and ratios.

- Three copies of a three-line drawing for three phase units or a two-line drawing for single phase units showing the AC connections to the relays, if required herein, and meters.
  - The generator nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed and locked rotor current.
  - If the Facility owns the transformer between the Company and the Facility, the generator step up transformer nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.
  - A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.
  - Schematic drawings showing the control circuits for the interconnection breaker(s) or contactor(s).
  - Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
  - The proposed grounding method for the stator winding of the generator.
  - Other information that may be determined by the Company as required for a specific interconnection.
- b. The Interconnecting Customer must submit to the Company relay settings for all Facility protective relays that affect the interconnection with the Company's system at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c. A Facility using induction generator(s) connected in the vicinity of capacitance sufficient to self-excite the generator(s) must meet the requirements for synchronous machines of the same Category. The capacitors that enable self-excitation may actually be external to

the Facility and may belong to the Company or to other customers of the Company. The Company will not restrict the existing or future application of capacitors on its lines nor restrict their use by other customers to accommodate a Facility with induction machines.

- d. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements for synchronous machines if self-excitation becomes possible even if not initially possible.
- e. A circuit breaker or contactor shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker" or "Interconnection Contactor"). If there is more than one Interconnection Breaker or Interconnection Contactor, the requirements of this Protection Policy shall apply to each one individually.
- f. The Company will review the relay settings as submitted to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Facility shall be responsible for protection of its system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.
- g. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- h. In general, across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting

of similar sized motors. If an Interconnection Breaker or latching type contactor is to be tripped by protective relays to satisfy this Protection Policy, then the Interconnection Breaker or Interconnection Contactor control circuits shall be DC powered from a station battery or Company-approved equivalent.

- i. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like shall be used in this logic.
- j. The Facility shall provide a disconnect switch at the interconnection point with the Company that is accessible to Company personnel at all times that can be opened for isolation. The Company shall have the right to open this disconnect switch during emergency conditions or with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.
- k. Where protective relays are required by this Protection Policy, their control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery. If the Facility uses a non-latching interconnection contactor, AC powered relaying satisfying the requirements of this Protection Policy may be allowed provided the relay and its method of application is fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay will immediately trip the generator by opening the coil circuit of the Interconnection Contactor.
- l. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault

conditions.

- m. If the interconnection voltage requires, a voltage transformer shall be provided by the Facility and shall be connected to the Company side of the Interconnecting Breaker or Interconnecting Contactor. The voltage from this VT shall be used in the interlock as specified above. For three phase applications, a VT for each phase is required.
- n. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacturer and type generally accepted for use by the Company.
- o. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- p. Tripping by protective relays required to satisfy this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- p. On three phase installations where voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company, the unit shall be tripped.
- q. The Facility shall provide an undervoltage relay sensing voltage, preferably on the Company's side of the Interconnection Breaker or Interconnection Contactor, which trips the Interconnection Breaker or Interconnection Contactor; provided, however, for single phase units, an undervoltage relay is not required, provided the generator is interconnected through a non-latching contactor whose coil is held by AC voltage from the Company's side of the contactor such that the contactor drops out and will not close in the absence of Company voltage.

**Requirements for Synchronous Generator (Type C) installations:**

Category 1 Facilities utilizing synchronous generators shall meet all the requirements that are

applicable to synchronous generators for Category 2, 3, 4 and 5 Facilities.

## Category 2 Facilities

**General Requirements:** The Facility shall provide a disconnect switch at the interconnection point with the Company that can be opened for isolation. The switch shall be in a location accessible to Company personnel at all times. The Company shall have the right to open this disconnect switch during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a type generally accepted for use by the Company.

### **Requirements for Inverter-based (Type A) installations:**

- a. The Company's distribution circuits generally operate with automatic reclosing following a trip with automatic reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Facility is responsible for protecting its equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation.
- b. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Company's approving the Interconnecting Customer's request for interconnection:
  - c. An electrical one line diagram or sketch depicting how the inverter will be interconnected relative to the service entrance panel and the electric meter.
  - c. The make, model and manufacturer's specification sheet for the inverter.

- c. For Facilities that utilize photovoltaic technology, it is required that the system be installed in compliance with IEEE Standard 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems". It is required that the inverter meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems".
- d. For Facilities that utilize wind technology, fuel cell technology or other inverter-based systems, the inverter must meet the Underwriters Laboratories Inc. Standard UL 1741, "Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems".

**Requirements for Induction Generator (Type B) installations:**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
  - Three copies of a Facility one-line drawing.
  - Three copies of a one-line drawing showing the relays, if required herein, and metering including current transformer ("CT") and voltage transformer ("VT") connections and ratios.
  - Three copies of a three-line drawing for three phase units or a two-line drawing for single phase units showing the AC connections to the relays, if required herein, and meters.
  - The generator nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed and locked rotor current.
  - If the Facility owns the transformer between the Company and the Facility, the generator step up transformer nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.

- A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.
  - Schematic drawings showing the control circuits for the interconnection breaker(s) or contactor(s).
  - Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
  - The proposed grounding method for the stator winding of the generator.
  - Other information that may be determined by the Company as required for a specific interconnection.
- b. Relay settings for all Facility protective relays that affect the interconnection with the Company's system must be submitted at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c. A Facility using induction generator(s) connected in the vicinity of capacitance sufficient to self-excite the generator(s) must meet the requirements for synchronous machines of the same Category. The capacitors that enable self-excitation may actually be external to the Facility and may belong to the Company or to other customers of the Company. The Company will not restrict the existing or future application of capacitors on its lines nor restrict their use by other customers to accommodate a Facility with induction machines.
- d. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements for synchronous machines if self-excitation becomes possible even if not initially possible.
- e. A circuit breaker or contactor shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker" or "Interconnection Contactor"). If there is more than one Interconnection Breaker or Interconnection Contactor, the requirements of this Protection Policy shall apply to each one individually.



- f. The Company will review the relay settings as submitted by the Interconnecting Customer to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Facility shall be responsible for protection of its system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.
- g. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- h. In general, across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting of similar sized motors. If an Interconnection Breaker or latching type contactor is to be tripped by protective relays to satisfy the requirements of this Protection Policy, then the Interconnection Breaker or Interconnection Contactor control circuits shall be DC powered from a station battery or Company-approved equivalent.
- i. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like shall be used in this logic.

- j. The Facility shall provide a disconnect switch at the interconnection point with the Company that is accessible to Company personnel at all times that can be opened for isolation. The Company shall have the right to open this disconnect switch during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.
- k. Where protective relays are required by this Protection Policy, their control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery. If the Facility uses a non-latching interconnection contactor, AC powered relaying satisfying the requirements of this Protection Policy may be allowed provided the relay and its method of application is fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay will immediately trip the generator by opening the coil circuit of the Interconnection Contactor.
- l. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault conditions.
- m. If the interconnection voltage requires, a voltage transformer shall be provided by the Facility and shall be connected to the Company side of the interconnecting breaker or contactor. The voltage from this VT shall be used in the interlock as specified above. For three phase applications, a VT for each phase is required.
- n. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacturer and type generally accepted for use by the Company.

- o. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- p. Tripping by protective relays required to satisfy the requirements of this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- q. On three phase installations where voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company, the unit shall be tripped.
- r. The Facility shall provide an undervoltage relay sensing voltage, preferably on the Company's side of the interconnection breaker or contactor, which trips the interconnection breaker or contactor.

**Requirements for Synchronous Generator (Type C) installations:**

Category 2 Facilities utilizing synchronous generators shall meet all the requirements that are applicable to synchronous generators for Category 3, 4 and 5 Facilities.

## **CATEGORY 3, 4 and 5 Facilities**

### **Protection related information**

- a. The following information must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Interconnecting Customer finalizing the Facility's protection design and the Company's approving the Interconnecting Customer's request for interconnection:
- P Three copies of a station one-line drawing.
  - P Three copies of a one-line drawing showing the relays and metering including current transformer (CT) and voltage transformer (VT) connections and ratios.
  - P Three copies of a three-line drawing showing the AC connections to the relays and meters.
  - P If the Facility is a synchronous generator, the nameplate information including rated voltage, rated current, rated kVA and power factor plus transient, sub-transient and synchronous impedances and zero sequence impedance.
  - P If the Facility is an induction generator, the nameplate information including rated voltage, rated current, power factor, HP/kW, rated speed, locked rotor current, stator reactance, stator resistance, rotor reactance, rotor resistance and magnetizing reactance.
  - P If the Facility owns the transformer between the Company and the Facility, the nameplate information including rated voltage, rated kVA, proposed winding connections, positive sequence impedance plus zero sequence impedance and zero sequence equivalent circuit.
  - A list of protective relay equipment proposed to be furnished to conform to this Protection Policy including relay types, styles, manufacturer's catalog numbers, ranges and descriptive bulletins. Three copies of applicable relay instruction manuals may also be required if the Company does not already possess them.

- P** Schematic drawings showing the control circuits for the interconnection breaker(s) and synchronizing breaker(s).
- P** Specifications for CTs and VTs relevant to the interconnection including their make, model, accuracy class, ratio, and available taps.
- P** Interconnection breaker operating time if it is tripped by protective relays required by this Protection Policy.
- P** The proposed grounding method for the stator winding.
- P** Other information that may be determined by the Company as required for a specific interconnection.
- b.** Relay settings for all Facility protective relays that affect the interconnection with the Company's system must be submitted at least four weeks prior to the scheduled date for setting the relays for review and acceptance by the Company.
- c.** If, due to the interconnection of the Facility to the line, the fault interrupting, continuous, momentary or other rating of any of the Company's equipment or the equipment of other customers connected to the Company's system is exceeded, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of equipment to eliminate the condition. Likewise, when the proposed interconnection may result in reversed load flow through the Company's load tap changing transformer(s), line voltage regulator(s) or secondary network protector(s), control modifications necessary to mitigate the effects may be made to these devices by the Company at the Interconnecting Customer's expense or the Facility may be required to limit its output so reverse load flow cannot occur or to provide reverse power relaying that trips the Facility. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

### **Protection requirements**

- a. A circuit breaker shall be installed to isolate the Facility from the Company's system ("Interconnection Breaker"). If there is more than one Interconnection Breaker, the requirements of this Protection Policy apply to each one individually.
- b. The Interconnecting Customer shall designate one or more breakers to be used to synchronize the Facility's generator to the Company's system. This "synchronizing breaker" could be a breaker other than the Interconnection Breaker. In some induction generator applications a contactor may serve this function.
- c. The Company's lines generally have automatic reclosing following a trip with reclosing times as short as five seconds without regard to whether the Facility is keeping the circuit energized. The Interconnecting Customer is responsible for protecting the Facility's equipment from being re-connected out of synchronism with the Company's system by an automatic line reclosure operation. The Interconnecting Customer may choose to install additional equipment such as direct transfer tripping from the Company's station(s) to insure the Facility is off the line prior to the line reclosing. However this option is not feasible in all cases, particularly where the Company uses pole-mounted reclosers between its substation and the Facility.
- d. The Company will review the relay settings as submitted by the Interconnecting Customer to assure adequate protection for the Company's facilities. The Company shall not be responsible for the protection of the Facility's facilities. The Interconnecting Customer shall be responsible for protection of the Facility's system against possible damage resulting from parallel operation with the Company. If requested by the Interconnecting Customer, the Company will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Interconnecting Customer in evaluating protection of the Facility's facilities during parallel operation.

- e. The Company reserves the right to specify the winding connections for the transformer between the Company's voltage and the Facility's voltage ("Step Up Transformer") as well as whether it is to be grounded or ungrounded at the Company's voltage. In the event that the transformer winding connection is grounded-wye/grounded-wye the Company also reserves the right to specify if and how the generator stator is to be grounded. The Facility will be responsible for procuring its equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.
- f. Across the line starting of rotating machines is not permitted unless it can be demonstrated that the resultant voltage flicker is within the Company's limits for starting of similar sized motors.

#### **Protection equipment requirements**

- a. Where the Interconnection Breaker (or Interconnection Contactor as may be the case with some smaller induction machines) is to be tripped by protective relays required to meet the requirements of this Protection Policy then the Interconnection Breaker (or Interconnection Contactor) control circuits shall be DC powered from a station battery.
- b. The synchronizing breaker(s) must be capable of withstanding at least twice rated system voltage and must be capable of interrupting the current produced when the Facility is connected out of phase with the Company's system.
- c. A control interlock scheme that detects voltage on the Company's line(s) shall be used to prevent the Facility from energizing or attempting to energize the Company's line(s). The logic for this scheme should be hardwired to prevent the synchronizing breaker, Interconnection Breaker (or Interconnection Contactor where appropriate) from closing. No interposing computer or programmable logic controller or the like is to be used in this logic.
- d. The Facility shall be equipped with a switch at the interconnection point with the Company that can be opened for isolation. The Company shall have the right to open the

interconnection during emergency conditions and with reasonable notice to the Interconnecting Customer at other times. The Company shall exercise such right in accordance with Good Utility Practice. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The switch shall be of a manufacture and type generally accepted for use by the Company.

- e. Protective relaying control circuits shall be DC powered from a station battery. Solid-state relays shall be self-powered or DC powered from a station battery.
- f. CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are less than 10% under maximum fault conditions.
- g. The Facility shall be equipped with a voltage transformer, connected to the Company side of the interconnecting breaker. The voltage from this VT shall be used in the interlock as specified in this Protection Policy. If the Facility's step up transformer is ungrounded at the Company voltage, this VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on the Company's side of the Facility's step up transformer, rated for phase-to-phase voltage and provided with two secondary windings. One winding shall be connected in open delta, have a loading resistor to prevent ferroresonance, and be used for the relay specified in this Protection Policy.
- h. All protective relays required by this Protection Policy shall meet ANSI/IEEE Standard C37.90, C37.90.1 and C37.90.2 and be of a manufacture and type generally accepted for use by the Company.
- i. Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70Hz.
- j. Protective relays utilized by the Facility as required per this Protection Policy shall be sufficiently redundant and functionally separate so as to provide adequate protection, as



determined by the Company, upon the failure of any one component. The use of a single all-inclusive relay package is not acceptable.

- k. The Company may require the Facility to be equipped with two independent, redundant relaying systems in accordance with NPCC criteria for the protection of the bulk power system if the interconnection is to the bulk power system or if it is determined that delayed clearing of faults within the Facility adversely affects the bulk power system.
- l. A direct transfer tripping system, if one is required by either the Interconnecting Customer or by the Company, shall use equipment generally accepted for use by the Company and shall, at the option of the Company, use dual channels.
- m. Tripping by protective relays required to satisfy the requirements of this Protection Policy must be hardwired to the device they are tripping. No interposing computer or programmable logic controller or the like is permitted in the trip chain between the relay and the device being tripped.
- n. On three phase installations when voltage relaying is required by this Protection Policy, all three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the Company the unit shall be tripped.

#### **Requirements for Induction Generator (Type B) installations**

- a. A Facility using induction generators connected in the vicinity of capacitance sufficient to self-excite the generator(s) shall meet the requirements for synchronous machines in this Protection Policy. The capacitors that enable self-excitation may actually be external to the Facility. The Company will not restrict its existing or future application of capacitors on its lines nor restrict their use by other customers of the Company to accommodate a Facility with induction machines. As changes occur in the location and size of capacitors, the Facility may be required in the future to upgrade its interface to meet the requirements

for synchronous machines if self-excitation becomes possible, even if not initially possible.

The Facility may be required to install capacitors to limit the adverse effects of drawing reactive power from the system for excitation of the generator. Capacitors for supply of reactive power at or near the induction generator with a kVAR rating greater than 30% of the generator's kW rating may cause the generator to become self-excited. (If self-excitation can occur, the Facility shall be required to provide protection as specified in this Protection Policy for synchronous machines.)

- b. The Facility shall be equipped with the following relays for island detection supplied from a voltage transformer that may be connected to either the generator or Company voltage:

	<u>minimum setting range</u>	<u>minimum time delay range</u>
C overfrequency	60 - 62Hz	.1 - 2 secs
C underfrequency	60 - 58Hz	.1 - 2 secs
C overvoltage	105 - 115% normal	.1 - 4 secs
C undervoltage	85 - 95% normal	.1 - 4 secs

- c. During system conditions where local area load exceeds system generation, NPCC Emergency Operation Criteria requires a program of phased automatic underfrequency load shedding of up to 25% of area load to assist in arresting frequency decay and to minimize the possibility of system collapse. Depending on the point of connection of the Facility to the Company's system and in conformance with the NPCC Emergency Operating Criteria, the Facility may be required to remain connected to the system during the frequency decline to allow the objectives of the automatic load shedding program to be achieved, or to otherwise provide compensatory load reduction, equivalent to the

Facility's generation lost to the system, if the Interconnecting Customer elects to disconnect the Facility at a higher underfrequency set point.

### **Requirements for Synchronous Generator (Type C) installations**

- a. A synchronous generator is a source of current for faults occurring on the Company's line(s). The Facility must be equipped with protective relays to detect any faults, whether phase-to-phase or phase-to-ground, on the Company's line(s) or within the Facility, and isolate the Facility from the Company's line(s) such that the following criteria are met, as determined by the Company:
  - C The existing sensitivity of fault detection is not substantially degraded.
  - C The existing speed of fault clearing is not substantially degraded.
  - C The coordination margin between relays is not substantially reduced.
  - C The sustained unfaulted phase voltage during a line-to-ground fault is not increased beyond the design value for the existing system insulation levels and overvoltage protection.
  - C Non-directional line relays will not operate for faults external to the line due to the Facility's contribution.
  - C Proper settings for existing relays are achievable within their ranges.

The Company may perform engineering studies to evaluate the Facility's protection compliance with respect to the above and may make recommendations to the Interconnecting Customer on methods to achieve compliance. If, due to the interconnection of the Facility to the Company's system, any of the above criteria is violated for the Company's facilities or for the facilities of others connected to the Company's system, the Company shall have the right to require the Interconnecting Customer to pay for the purchase, installation, replacement or modification of protective equipment to eliminate the violation and restore the level of protection existing prior to

the interconnection. This may include the addition of pilot relaying systems involving communications between all terminals. Where such action is deemed necessary by the Company, the Company will, where possible, permit the Interconnecting Customer to choose among two or more options for meeting the Company's requirements as described in this Protection Policy.

- b.** The Interconnecting Customer is responsible for procuring any communications channels necessary between the Facility and the Company's stations and for providing protection from transients and overvoltages at all ends of these communication channels. The Interconnecting Customer will also bear the ongoing cost to lease these communication channels.
- c.** If the Facility's step up transformer connection is ungrounded, the Facility shall be equipped with a zero sequence overvoltage relay fed from the open delta of the three phase VT specified in this Protection Policy.
- d.** The Facility shall be equipped to provide protection to limit sustained abnormal frequency and/or voltage conditions to the Company's customers directly supplied from the interconnection circuit should the Facility and its interconnection circuit become isolated from the Company's system. The protection can consist of either the following relays supplied from a voltage transformer connected to either the generator or the Company's voltage or other means if the Facility can demonstrate sufficient control of abnormal frequency and voltage excursions as seen by the Company's customers:

	<u>minimum setting range</u>	<u>minimum time delay range</u>
C overfrequency	60 - 62Hz	.1 - 2 secs
C underfrequency	60 - 56Hz	.5 - 30 secs
C overvoltage	105 - 115% normal	.1 - 4 secs
C undervoltage	85 - 95% normal	.1 - 4 secs

- e. During system conditions where local area load exceeds system generation, NPCC Emergency Operation Criteria requires a program of phased automatic underfrequency load shedding of up to 25% of area load to assist in arresting frequency decay and to minimize the possibility of system collapse. Depending on the point of connection of the Facility to the Company's system and in conformance with the Emergency Operating Criteria, the Facility may be required to remain connected to the system during the frequency decline to allow the objectives of the automatic load shedding program to be achieved, or to otherwise provide compensatory load reduction, equivalent to the Facility's generation lost to the system, if the Interconnecting Customer elects to disconnect the Facility at a higher underfrequency set point.
- e. The Facility may be required to use high-speed protection if time-delayed protection would result in degradation in the existing sensitivity or speed of the protection systems on the Company's lines.
- g. The Facility may be required to be equipped to provide local breaker failure protection which may include direct transfer tripping to the Company's line terminal(s) in order to detect and clear faults within the Facility that cannot be detected by the Company's back-up protection.
- h. The Facility shall be equipped to provide protective relaying to prevent the closing of the synchronizing breaker(s) while the Facility's generation is out-of-synchronization with the Company's system.

## **II Protection System Testing and Maintenance**

The Company shall have the right to witness the testing of selected protective relays and control circuits at the completion of construction and to receive a copy of all test data.

The Interconnecting Customer shall provide the Company with at least a one week notice prior to the final scheduling of these tests. Testing shall consist of:

- c CT and CT circuit polarity, ratio, insulation, excitation, continuity and burden

tests.

- C VT and VT circuit polarity, ratio, insulation and continuity tests.
- C Relay pick-up and time delay tests.
- C Functional breaker trip tests from protective relays.
- C Relay in-service test to check for proper phase rotation and magnitudes of applied currents and voltages.
- C Breaker closing interlock tests.
- C Paralleling and de-paralleling operation.
- C Other relay commissioning tests typically performed for the relay types involved.
- C An inverter with field adjustable settings for its internal protective elements shall be tested to verify these settings if those internal elements are being used by the Facility to satisfy the requirements of this Protection Policy . The Facility shall be equipped with whatever equipment is required to perform this test. If a Asimulated utility@is required to perform such testing the Company is unable to provide the equipment required to perform the test.

The protective relays shall be tested and maintained by the Interconnecting Customer on a periodic basis but not less than once every four years or as otherwise determined by the Company. For relays installed in accordance with the NPCC Criteria for the Protection of the Bulk Power System, maintenance intervals shall be in accordance with such criteria. The results of these tests shall be summarized by the Interconnecting Customer and reported in writing to the Company.

Inverters with field adjustable settings for their internal protective elements shall be periodically tested if those internal elements are being used by the Facility to satisfy the requirements of this Protection Policy. If a simulated utility is required to perform such testing the Company is unable to provide the equipment required to perform the test.

In its sole discretion, the Company may waive all or some of these requirements.

### **III. Protection Requirements – Momentary Paralleling of Standby Generators**

Protective relays to isolate the Facility for faults in the Company's system are not required if the paralleling operation is automatic and takes place for less than one-half of a second.

Parallel operation of the Facility with the Company's system shall be prevented when the Company's line is dead or out of phase with the Facility.

The control scheme for automatic paralleling must be submitted by the Interconnecting Customer for review and acceptance by the Company prior to the Facility being allowed to interconnect with the Company's system.

### **IV. Protection System Changes**

The Interconnecting Customer must provide the Company with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. The Company will determine if such proposed changes require re-acceptance of the interconnection per the requirements of this Protection Policy.

In the future, should the Company implement changes to the system to which the Facility

is interconnected, the Interconnecting Customer will be responsible at its own expense for identifying and incorporating any necessary changes to its protection system. These changes to the Facility's protection system are subject to review and approval by the Company.

In its sole discretion, the Company may waive all or some of these requirements.



## **EXHIBIT 4**

### **Form of Distribution Facilities Impact Study Agreement**

This Agreement dated \_\_\_\_\_, is entered into by  
(the Interconnecting Customer) and the Company, for the purpose of setting forth the terms,  
conditions and costs for conducting a Distribution Facilities Impact Study relative to  
\_\_\_\_\_.

1. The Interconnecting Customer agrees to provide, in a timely and complete manner, all required information and technical data necessary for the Company to conduct the Distribution Facilities Impact Study. The Interconnecting Customer understands that it must provide all such information and data prior to the Company's commencement of the Distribution Facilities Impact Study. Such information and technical data is specified in Attachment 1 to this Agreement.
2. All work pertaining to the Distribution Facilities Impact Study that is the subject of this Agreement will be approved and coordinated only through designated and authorized representatives of the Company and the Interconnecting Customer. Each party shall inform the other in writing of its designated and authorized representative.
3. The Company will advise the Interconnecting Customer of any additional studies as it may in its sole discretion deem necessary, in accordance with Good Utility Practice. The Company will not proceed with additional studies without the Interconnecting Customer's consent.
4. The Company contemplates that it will require [specify time] to complete the Distribution Facilities Impact Study. Upon completion of the Distribution Facilities Impact Study by

the Company, the Company will provide a Distribution Facilities Impact Study Report to the Interconnecting Customer based on the information provided and developed as a result of this effort. If, upon review of the Distribution Facilities Impact Study Report, the Interconnecting Customer decides to pursue its interconnection request, the Company will, at the Interconnecting Customer's direction, tender a Distribution Facilities Detailed Study Agreement within thirty (30) days if deemed additionally necessary by the Company. The Distribution Facilities Impact Study and Distribution Facilities Detailed Study, together with any additional studies contemplated in Paragraph 3, shall form the basis for the Interconnecting Customer's proposed use of the Company's Distribution System and shall be furthermore utilized in obtaining necessary third-party approvals of any required facilities and requested distribution services. The Interconnecting Customer understands and acknowledges that any use of study results by the Interconnecting Customer or its agents, whether in preliminary or final form, prior to NEPOOL 18.4 approval, should such approval be required, is completely at the Interconnecting Customer's risk and that the Company will not guarantee or warrant the completeness, validity or utility of study results prior to NEPOOL 18.4 approval.

5. The estimated costs contained within this Agreement are the Company's good faith estimate of its costs to perform the Distribution Facilities Impact Study contemplated by this Agreement. The Company's estimates do not include any estimates for wheeling charges that may be associated with the transmission of Facility output to third parties or with rates for station service. The actual costs charged to the Interconnecting Customer by the Company may change as set forth in this Agreement. Prepayment will be required for all study, analysis, and review work performed by the Company or its Affiliate, all of which will be billed by the Company to the Interconnecting Customer in accordance with Paragraph 6 of this Agreement.
6. The payment required is \$\_\_\_\_\_ from the Interconnecting Customer to the Company for the primary system analysis, coordination, and monitoring of the Distribution Facilities

Impact Study. Such amount shall be payable in full to the Company prior to the Company beginning the work. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increases for work to be performed if the total amount increases by 10% or more. Any such changes to the Company's costs for the study work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) days of the Company's notice of increase, either authorize such increases and make payment in the amount set forth in such notice, or the Company will suspend the Distribution Facilities Impact Study and this Agreement will terminate. Upon suspension of the Distribution Facilities Impact Study, the parties may petition the Massachusetts Department of Telecommunications and Energy, to review the cost increase, pursuant to 220 CMR 8.04(3).

In the event this Agreement is terminated for any reason, the Company shall refund to the Interconnecting Customer the portion of the above credit or any subsequent payment to the Company by the Interconnecting Customer that the Company did not expend or commit in performing its obligations under this Agreement. Any additional billings under this Agreement shall be subject to an interest charge computed in accordance with the provisions of the Interconnection Requirements Document. Payments for work performed shall not be subject to refunding except in accordance with Paragraph 7 below.

7. If the actual costs for the work exceed prepaid estimated costs, the Interconnecting Customer shall make payment to the Company for such actual costs within thirty (30) days of the date of the Company's invoice for such costs. If the actual costs for the work are less than those prepaid, the Company will credit such difference toward the Company costs unbilled, or in the event there will be no additional billed expenses, the amount of the overpayment will be returned to the Interconnecting Customer with interest computed as stated in Paragraph 6 of this Agreement, from the date of reconciliation.

8. Nothing in this Agreement shall be interpreted to give the Interconnecting Customer immediate rights to wheel over or interconnect with the Company's Distribution System.
9. Within one (1) year following the Company's issuance of a final bill under this Agreement, the Interconnecting Customer shall have the right to audit the Company's accounts and records at the offices where such accounts and records are maintained, during normal business hours; provided that appropriate notice shall have been given prior to any audit and provided that the audit shall be limited to those portions of such accounts and records that relate to service under this Agreement. The Company reserves the right to assess a reasonable fee to compensate for the use of its personnel time in assisting any inspection or audit of its books, records or accounts by the Interconnecting Customer or its Designated Agent.
10. The Interconnecting Customer agrees to indemnify and hold the Company and its affiliated companies and directors, officers, employees, and agents of each of them (collectively "Affiliates") harmless from and against any and all damages, costs (including attorney's fees), fines, penalties and liabilities, in tort, contract, or otherwise (collectively "Liabilities") resulting from claims of third parties arising, or claimed to have arisen as a result of any acts or omissions by the Company or its Affiliates under this Agreement. The Interconnecting Customer hereby waives recourse against the Company and its Affiliates for, and releases the Company and its Affiliates from, any and all Liabilities for or arising from damage to its property due to a performance under this Agreement by the Company or its Affiliates.
11. If either party materially breaches any of its covenants hereunder, the other party may terminate this Agreement by serving notice of same on the other party to this Agreement.
12. This agreement shall be construed and governed in accordance with the laws of the Commonwealth of Massachusetts and with 220 C.M.R. ' 8.00 et seq.

13. All amendments to this Agreement shall be in written form executed by both parties.
14. The terms and conditions of this Agreement shall be binding on the successors and assigns of either party.
15. This Agreement will remain in effect for a period of up to two years from its effective date as permitted by the Massachusetts Department of Telecommunications and Energy, and is subject to extension by mutual agreement. Either party may terminate this Agreement by thirty (30) days' notice except as is otherwise provided herein.

Interconnecting Customer:

The Company:

Name: \_\_\_\_\_

Name:

Title: \_\_\_\_\_

Title:

Date: \_\_\_\_\_

Date:

## **Attachment 1**

### **Information to be Provided to the Company by the Interconnecting Customer for the Distribution Facilities Impact Study**

*Note: For Category 1, 2 or 3 Facilities, the Company will accept the material requested in Exhibit 3 in lieu of the information requested in this attachment.*

#### **1.0 Facilities Identification**

- 1.1 Requested capability in MW and MVA; summer and winter
- 1.2 Site location and plot plan with clear geographical reference
- 1.3 Preliminary one-line diagram showing major equipment and extent of Interconnecting Customer
- 1.4 Auxiliary power system requirements
- 1.5 Back-up facilities such as standby generation or alternate supply sources

#### **2.0 Major Equipment**

- 2.1 Power transformer(s): rated voltage, MVA and BIL of each winding, LTC and or NLTC taps and range,  $Z_1$  (positive sequence) and  $Z_0$  (zero sequence) impedances, and winding connections. Provide normal, long-time emergency and short-time emergency thermal ratings.
- 2.2 Generator(s): rated MVA, speed and maximum and minimum MW output, reactive capability curves, open circuit saturation curve, power factor (V) curve, response (ramp) rates, H (inertia), D (speed damping), short circuit ratio,  $X_1$  (leakage),  $X_2$  (negative sequence), and  $X_0$  (zero sequence) reactances and other data:

	Direct Axis	Quadrature Axis
saturated synchronous reactance	$X_{dv}$	$X_{qv}$
unsaturated synchronous reactance	$X_{di}$	$X_{qi}$
saturated transient reactance	$X_{\bar{d}v}$	$X_{\bar{q}v}$
unsaturated transient reactance	$X_{\bar{d}i}$	$X_{\bar{q}i}$
saturated subtransient reactance	$X_{@dv}$	$X_{@qv}$
unsaturated subtransient reactance	$X_{@di}$	$X_{@qi}$
transient open-circuit time constraint	$T_{\bar{d}o}$	$T_{\bar{q}o}$
transient short-circuit time constraint	$T_{\bar{d}}$	$T_{\bar{q}}$
subtransient open-circuit time constraint	$T_{@do}$	$T_{@qo}$
subtransient short-circuit time constraint	$T_{@d}$	$T_{@q}$

- 2.3 Excitation system, power system stabilizer and governor: manufacturer's data in sufficient detail to allow modeling in transient stability simulations.
- 2.4 Prime mover: manufacturer's data in sufficient detail to allow modeling in transient stability simulations, if determined necessary.
- 2.5 Busses: rated voltage and ampacity (normal, long-time emergency and short-time emergency thermal ratings), conductor type and configuration.
- 2.6 Transmission lines: overhead line or underground cable rated voltage and impeached (normal, long-time emergency and short-time emergency thermal rates),  $Z_1$  (positive sequence) and  $Z_0$  (zero sequence) impedances, conductor type, configuration, length and termination points.

- 2.7 Motors greater than 150 kWh 3-phase or 50 kW single-phase: type (induction or synchronous), rated hp, speed, voltage and current, efficiency and power factor at 2, 3/4 and full load, stator reactance and reactance, rotor reactance and reactance, magnetizing reactance.
- 2.8 Circuit breakers and switches: rated voltage, interrupting time and continuous, interrupting and momentary currents. Provide normal, long-time emergency and short-time emergency thermal ratings.
- 2.9 Protective relays and systems: ANSI function number, quantity manufacturer's catalog number, range, descriptive bulletin, tripping diagram and three-line diagram showing AC connections to all relaying and metering.
- 2.10 CTs and VTs: location, quantity, rated voltage, current and ratio.
- 2.11 Surge protective devices: location, quantity, rated voltage and energy capability.
- 3.0 Other
  - 3.1 Additional data to perform the Distribution Facilities Impact Study will be provided by the Interconnecting Customer as requested by the Company.
  - 3.2 The Company reserves the right to require specific equipment settings or characteristics necessary to meet NEPOOL and NPCC criteria and standards.



## **EXHIBIT 5**

### **Form of Distribution Facilities Detailed Study Agreement**

This agreement dated \_\_\_\_\_, is entered into by  
(the Interconnecting Customer) and the Company for the purpose of setting forth the terms,  
conditions and costs for conducting a Distribution Facilities Detailed Study relative to  
\_\_\_\_\_. The Distribution Facilities Detailed Study will  
determine the detailed engineering, design and cost of the facilities necessary to satisfy the  
Interconnecting Customer's request for service interconnecting with the Company's Distribution  
System.

1. The Interconnecting Customer agrees to provide, in a timely and complete manner, all required information and technical data necessary for the Company to conduct the Distribution Facilities Detailed Study. Where such information and technical data was provided for the Distribution Facilities Impact Study, it should be reviewed and updated with current information, as required.
2. All work pertaining to the Distribution Facilities Detailed Study that is the subject of this Agreement will be approved and coordinated only through designated and authorized representatives of the Company and the Interconnecting Customer. Each party shall inform the other in writing of its designated and authorized representative.
3. The Company will advise the Interconnecting Customer of additional studies, as in its sole discretion deem necessary, in accordance with Good Utility Practice. The Company will not proceed with additional studies without the Interconnecting Customer's consent.
4. The Company contemplates that it will require [specify time] to complete the Distribution Facilities Detailed Study. Upon completion of the Distribution Facilities Detailed Study, the Company will provide a Distribution Facilities Detailed Study Report to the

Interconnecting Customer based on the information provided and developed as a result of this effort. If, upon review of the Distribution Facilities Detailed Study Report, the Interconnecting Customer decides to pursue its interconnection service request, the Interconnecting Customer must sign an Interconnection Service Agreement with the Company. The Distribution Facilities Impact Study and Distribution Facilities Detailed Study, together with any additional studies contemplated in Paragraph 3, shall form the basis for the Interconnecting Customer's proposed use of the Company's Distribution System and shall be furthermore utilized in obtaining necessary third-party approvals of any facilities and requested services. The Interconnecting Customer understands and acknowledges that any use of the study results by the Interconnecting Customer or its agents, whether in preliminary or final form should such approval be required, prior to NEPOOL 18.4 approval, is completely at the Interconnecting Customer's risk and that the Company will not guarantee or warrant the completeness, validity or utility of the study results prior to NEPOOL 18.4 approval.

5. The estimated costs contained within this Agreement are the Company's good faith estimate of its costs to perform the Distribution Facilities Detailed Study contemplated by this Agreement. The Company's estimates do not include any estimates for wheeling charges that may be associated with the transmission of Facility output to third parties or with rates for station service. The actual costs charged to the Interconnecting Customer by the Company may change as set forth in this Agreement. Prepayment will be required for all study, analysis, and review work performed by the Company or its Designated Agent's personnel, all of which will be billed by the Company to the Interconnecting Customer in accordance with Paragraph 6 of this Agreement.
6. The payment required is \$\_\_\_\_\_ from the Interconnecting Customer to the Company for the primary system analysis, coordination, and monitoring of the Distribution Facilities Detailed Study to be performed by the Company for the Interconnecting Customer's requested service. Such amount shall be payable in full to the Company prior to the

Company beginning the work. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increases for work to be performed if the total amount increases by 10% or more. Any such changes to the Company's costs for the study work to be performed shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) days of the Company's notice of increase, either authorize such increases and make payment in the amount set forth in such notice, or the Company will suspend the Distribution Facilities Detailed Study and this Agreement will terminate.

In the event this Agreement is terminated for any reason, the Company shall refund to the Interconnecting Customer the portion of the above credit or any subsequent payment to the Company by the Interconnecting Customer that the Company did not expend or commit in performing its obligations under this Agreement. Any additional billings under this Agreement shall be subject to an interest charge computed in accordance with the provisions of the Interconnection Requirements Document. Payments for work performed shall not be subject to refunding except in accordance with Paragraph 7 below.

7. If the actual costs for the work exceed prepaid estimated costs, the Interconnecting Customer shall make payment to the Company for such actual costs within thirty (30) days of the date of the Company's invoice for such costs. If the actual costs for the work are less than that prepaid, the Company will credit such difference toward the Company costs unbilled, or in the event there will be no additional billed expenses, the amount of the overpayment will be returned to the Interconnecting Customer with interest computed in accordance with the provisions of the Interconnection Requirements Document.
8. Nothing in this Agreement shall be interpreted to give the Interconnecting Customer immediate rights to wheel over or interconnect with the Company's Distribution System.

9. Within one (1) year following the Company's issuance of a final bill under this Agreement, the Interconnecting Customer shall have the right to audit the Company's accounts and records at the offices where such accounts and records are maintained, during normal business hours; provided that appropriate notice shall have been given prior to any audit and provided that the audit shall be limited to those portions of such accounts and records that relate to service under this Agreement. The Company reserves the right to assess a reasonable fee to compensate for the use of its personnel time in assisting any inspection or audit of its books, records or accounts by the Interconnecting Customer or its Designated Agent.
10. The Interconnecting Customer agrees to indemnify and hold the Company and its affiliated companies and directors, officers, employees, and agents of each of them (collectively "Affiliates") harmless from and against any and all damages, costs (including attorney's fees), fines, penalties and liabilities, in tort, contract, or otherwise (collectively "Liabilities") resulting from claims of third parties arising, or claimed to have arisen as a result of any acts or omissions of the Company or its Affiliates under this Agreement. The Interconnecting Customer hereby waives recourse against the Company and its Affiliates for, and releases the Company and its Affiliates from, any and all Liabilities for or arising from damage to its property due to a performance under this Agreement by the Company or its Affiliates.
11. If either party materially breaches any of its covenants hereunder, the other party may terminate this Agreement by serving notice of same on the other party to this Agreement.
12. This agreement shall be construed and governed in accordance with the laws of the Commonwealth of Massachusetts and with 220 C.M.R. ' 8.00 et seq.
13. All amendments to this Agreement shall be in written form executed by both parties.

14. The terms and conditions of this Agreement shall be binding on the successors and assigns of either party.
15. This Agreement will remain in effect for a period of up to two years from its effective date and is subject to extension by mutual agreement. Either party may terminate this Agreement by thirty (30) days' notice except as is otherwise provided herein.

Interconnecting Customer:

The Company:

Name: \_\_\_\_\_

Name:

Title: \_\_\_\_\_

Title:

Date: \_\_\_\_\_

Date:

## **EXHIBIT 6**

### **Insurance Requirements**

The Interconnecting Customer, at its own cost and expense, shall procure and maintain insurance in the forms and amounts acceptable to the Company at the following minimum levels of coverage:

- a) For Category 2 Facilities installed at a residential location:
  - Comprehensive General Liability Coverage including Operations, Contractual Liability and Broad Form Property Damage Liability written with limits no less than \$1,000,000.00 combined single limit for Bodily Injury Liability and Property Damage Liability.
  
- b) For Category 2 Facilities installed at a non-residential location and for all Category 3, 4 and 5 Facilities:
  - Statutory coverage for workers' compensation, and Employer's Liability Coverage with a limit no less than \$500,000.00 per accident;
  
  - Comprehensive General Liability Coverage including Operations, Contractual Liability and Broad Form Property Damage Liability written with limits no less than \$5,000,000.00 combined single limit for Bodily Injury Liability and Property Damage Liability; and
  
  - Automobile Liability for Bodily Injury and Property Damage to cover all vehicles used in connection with the work with limits no less than

\$1,000,000.00 combined single limit for Bodily Injury and Property Damage  
Injury.

Prior to commencing the work on a Category 2 Facility at a residential location, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above.

Prior to commencing the work on a Category 2 Facility at a non-residential location or on a category 3, 4 or 5 Facility, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above and the Interconnecting Customer shall notify and send copies to the Company of any policies maintained hereunder written on a "claims-made" basis. The Company may at its discretion require the Interconnecting Customer to maintain tail coverage for five years on all policies written on a "claims-made" basis.

Every contract of insurance providing the coverages required in this provision shall contain the following or equivalent clause: "No reduction, cancellation or expiration of the policy shall be effective until thirty (30) days from the date written notice thereof is actually received by the Interconnecting Customer.@ Upon receipt of any notice of reduction, cancellation or expiration, the Interconnecting Customer shall immediately notify the Company.

The Company and its Affiliates shall be named as additional insureds, as their interests may appear, on the Comprehensive General Liability and Automobile Liability policies described above.

The Interconnecting Customer shall waive all rights of recovery against the Company for any loss or damage covered by said policies. Evidence of this requirement shall be noted on all certificates of insurance provided to the Company.